This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

HM
251
.H473

A 486257 DUPL

THE TRUE STATISTICAL BASIS OF SCIENCE

AS

FACT IN THE SOCIAL ORDER

A Study in Social Psychology

BY

HENRY HEITMANN

PUBLISHED BY THE AUTHOR
POUGHKEEPSIE, N. Y.
1912

Price 50c postpaid

PRESENTED BY
THE AUTHOR

THE TRUE STATISTICAL BASIS OF SCIENCE

AS

FACT IN THE SOCIAL ORDER

A Study in Social Psychology

BY

HENRY HEITMANN

PUBLISHED BY THE AUTHOR
POUGHKEEPSIE, N. Y.
1912

COPYRIGHT, 1912, BY
HENRY HEITMANN
ALL RIGHTS RESERVED

Published December, 1912

PREFACE

As we undertake a systematic and detailed inventory of the results of science in the nineteenth and twentieth centuries and compare them with those of the whole period gone before, we find ourselves forcibly struck by the astonishing progress made by science within the short period, this mention of astonishment being the burden of frequent comment upon the matter. Yet little do we suspect that this frequently recognized occurrence of astonishment when contemplating the matter has in it an important element, or is an important factor in the further development, of the truth, for which mind shows itself to be unconsciously groping at the time. For, the course taken by science within the last fifty years, it may be summarily stated, cannot lead us to the supposed goal, because its methods have most peculiarly disregarded and still continued to disregard an important epistemological factor in the development of truth. This factor mind, in its astonishment at the results of science, unconsciously contemplates in a silent undercurrent of thought, namely, What after all can the wonderful results as such have to do with ourselves as it seems that we could walk away from them and leave them all indifferently behind? The efforts now making in the development and extension of science by these methods can thus at best appear to us only as a mere running to seed, an extensive development of detail in experience which lacks all enduring substance.

In the present paper the writer has endeavored to give a comprehensive statement of the working form of the principle involved in the actual formulations of science, the principle unconsciously sought in the ordinary astonishment at scientific results. A statement of the working principle with fuller detail for all experience the writer expects to publish in the near future.

Poughkeepsie, New York, 1911.

TABLE OF CONTENTS

I. INTRODUCTION—SCOPE OF THE SUBJECT-MATTER 5
II. THE PRESUPPOSITIONS IN OUR CONCEPTIONS OF THE SOCIAL ENVIRONMENT 12
1. THE FUNDAMENTAL FACTORS IN CONCEIVING OF A SOCIAL ENVIRONMENT 13
A. The Development of the Conscious Content of Understanding 14
B. The Content of Understanding becomes that of the Observed Social Order 17
2. THE PSYCHOPHYSICAL PARALLELISM IN CURRENT CONCEPTIONS OF OUR ENVIRONMENT 22
A. The Inadequacy of a Purely Mechanical Parallelism 23
B. The Unitary Dialectic Movement comprises all Factors of Observation 28
3. THE LAW OF CHANGE IN NATURE AS RELATED TO DIALECTIC IN CONSCIOUSNESS 33
A. The Essential Mode of Variation of Things in Nature 34
B. The Relations of Variation to Selection in Dialectic 38
III. THE LAW OF PROBABLE VARIATION OF INDIVIDUAL EXPERIENCE IN THE ORGANIC ACTION OF THE SOCIAL ORDER 42
1. THE SCALE OF PROBABILITY IN THE ORDINARY UNDERSTANDING OF THINGS 43
2. THE PROBABILITY SCALE IN THE ARRANGEMENT OF EXPERIENCE 47
A. Arrangement in the Environment in Nature 49
B. Arrangement of Individual Activity in a Social Environment 51
3. THE SCOPE AND PERMANENT BASIS OF SCIENCE 53
A. Origins and Sources of Science 54
B. Nature and Extent of Diversity in Science 56
C. Diversity of Proficiency of Individuals in Science reveals the Scope and Basis of Science in the Social Order 58

THE TRUE STATISTICAL BASIS OF SCIENCE AS FACT IN THE SOCIAL ORDER

A Study in Social Psychology

I. INTRODUCTION—SCOPE OF THE SUBJECT-MATTER

In this paper it is the purpose to approach the problem in hand from its epistemological aspect; for, this is already made unavoidable by the form of hypothesis in the currently accepted psychophysical parallelism in science, so that this aspect, by the tacit presuppositions of science, alone can immediately present the really accessible all-inclusive unity which, as all-inclusive, will present at once all the constitutive elements in the matter of the problem and thus alone give its truth. More specifically, the epistemological aspect always presents our whole experience, when it is such a unitary experience for us, as a single fact in which a particular matter now considered is an integral part, with definite relations to the rest, of the whole matter of our experience; and all of this matter of experience, as now the known content of the present active knowing, together with this knowing as distinguished from content, from the distinctive nature of these two elements, indissolubly forms the whole of the present single fact and its truth.

Proceeding here, then, to a more adequate though brief examination of the grounds for accepting this epistemological aspect as immediately having the all-inclusive form of truth itself, we may begin by noting that to the novice the precision in positive science, from its insistence on rigid analysis in investigations as presumedly giving true because fixed or unalterable results, is apt to appear at the outset as something absolutely definite and infallible and to induce his complete reliance on a present method and its immediate results as final. Yet science itself, as entirely composed of such methods and their results, has really had a development and still continues to develop, during the course of all of which a continual correc-

tion of previous method has taken place; in fact, some or most methods are of such a character that in their completed form they are not possible except as the final result of an extended development.[1] But no less important is the fact that we find we can become adequately acquainted with the data of experience, the determining physical basis of all method in science, only to a limited extent at any given time, even as pertaining directly or indirectly to our very existence; for, a multitude of things are found to occur in our environment which we do not notice because this is spatially and temporally impossible while other things are found to require special apparatus to aid observation and make recognition possible, the need of which has itself in many cases first to be discovered. We thus find ourselves compelled to search for, and choose, the needed data of experience for the rather arduous task of constructing what then still appears to be but an uncertain method of explaining experience; yet a result once attained, taken arbitrarily at any stage whatsoever, is afterwards nevertheless always found to be an immutable, as well as in its development inevitable, part in the scheme of things forming the course of experience.

Now, as the immediate result of the individual's limitations in space and time as well as his dependence on the degree of development of methods of observation and explanation, we find divergences in the results of observing what are presumedly entirely similar facts; but, the dependence of these divergences on actual conditions naturally not being seen as such, they are taken under certain circumstances to be errors, inaccuracies, or perhaps we would generally say carelessness, of observation, though for the most part they are still found actually unavoidable. To overcome these supposed errors we have come to make statistical enumerations, or groupings of a number of observations of the same fact or of similar facts, in order to derive an average value as representing presumedly more nearly the type of the fact observed. Such averages are then variously derived according to circumstances, being understood to require each its special mode of procedure for greater accuracy in its case. Thus to cite only the more elementary, we make use of the arithmetic average or the sum of n quantities divided by n; the geometric average or the nth root of the product of n quantities multiplied together; the harmonic average or the reciprocal of the arithmetic average of the reciprocals of the n quantities; and then again we use also the weighted average in some instances of these averages, in which a greater weight is assigned to certain quantities than to

[1] Cf. Poincaré, *La Science et l' Hypothèse*, Paris, 1909, Introduction.

others according to their importance so as to modify the general average in the direction of a greater accuracy. All these particular averages, however, do not throw much light on the actual meaning of the observed unavoidable divergences themselves between the same or similar facts nor do they assure by any means even absolute accuracy of result.

We recognize here, then, another aspect in any given statistical enumeration of material of experience, namely in addition to finding a uniformity in the facts determining their classification, that of finding also the meaning of the variation in these same facts; and these two are the significant component elements of the material in all statistical enumeration. Thus we might want to investigate so elementary a phenomenon as the rigidity of a given metal. Particularly where no great accuracy is required, this would seem off-hand to be merely a matter of measuring the amount of strain produced by a given amount of stress. However, for accurate knowledge as required for the operation of delicate apparatus or instruments of precision, the rigidity will be found to vary with the change in temperature, time or duration of applying tests, chemical purity of the metal, and so on; so that an absolute value for the rigidity may only be obtained for very specific conditions. Furthermore, the ascertainment of the exact conditions present in any given investigation is, for each condition that is to be exactly ascertained, likewise found to be dependent on other surrounding conditions, such that the apparently straightforward and simple investigation of an originally simple phenomenon is really involved in an endless chain, in fact runs in a circle, from which there is no escape. Any results attained are thus, in the first place, relative to immediately surrounding conditions themselves all relative to each other. The importance or significance of this relative character of results for science as such, though the fact of the relative character merely is fully recognized, does not yet appear to be adequately taken account of in the formulations of the sciences. The numerical values of these involved conditions in the aggregate, as those for instance in the rigidity of metals noted above, are mostly spoken of off-hand without further interpretation as the constant coefficients in larger phenomena; though in the social and biological sciences, where the complexity is great such as to make the concomitant variation of phenomena practically the only matter of interest to be studied, the use of coefficients of correlation, corresponding to the differential coefficient in the physical sciences, are now being introduced in order to express quantitatively the relations between phenomena and their conditions throughout a given range of variations. But in the

second place, the results are also relative to conditions of observation as immediately present in the investigator himself. This relativity involves not merely mental qualities of accuracy on the part of the observer but also his preconceptions ultimately derived from the civilization of the social order in which he works, already indicated in part by what was noted in regard to method above. The extent to which the influences of this psychic factor are taken into account in the sciences generally may be said to be practically nil.

To consider, then, these preconceptions in the physical sciences for instance, nature is here usually always assumed to be a rigid expanse into which we can, as it were, enter and make a mechanical division and appropriation of things to remain thereafter fixedly placed in such appropriation. But the diversified forms as contained in the expanse of nature about us can readily be shown to be only relatively rigid and not permanent; so that at present even the conception of a transmutability of elements of matter is receiving more and more acceptance, while in reference to a really absolute division of the expanse of nature anywhere the dictum, nature abhors a vacuum, has been an axiom in physics for some time. But further, it was in the light of the preconception of the occurrence of mere mechanical changes like the above in an expanse of nature, in which things or elements could and did merely stand in juxtaposition as absolute in and by themselves however close they might be, that the nebular hypothesis was formulated in which a purely mechanical motion of gases in space was understood to have gradually become reduced to the present cosmic motions of the universe and incidentally to have produced the heavenly bodies as now recognized in a surrounding space. At a certain point or definite stage in the course of this reduction of motion, the present observing consciousness is understood to have had, at the beginning of a continuous phyletic ancestral line, what is largely an accidental origin. This consciousness as now active is essentially conceived in the form of inner essence of the phenomenon in nature called life. The essential characteristic of this life is the continued persistence of a certain appearing form throughout a continual change of other adhering forms.[1] However, the true nature of present consciousness would be utterly impossible in such a purely mechanical and essentially inert cosmic process; for, the true present consciousness, not at all recognized as to its true nature in the foregoing cosmogonic concep-

[1]Cf. also Prof. Dr. W. Branca, *Der Stand unserer Kenntnisse vom fossilen Menschen*, Leipzig, 1910, p. 90 ff., as to separate subsequent creation of life.

tion, is that before which the whole universe now stands out entire with all its recognized forms in a manner to show that as it so stands out it must throughout be in immediate contact with consciousness ordinarily understood to be confined to a small portion of this universe, namely to the living body. This essentially reduces even the mere rigid spatial expanse, of nature as forming the universe about us, to an indispensable moment in an indissoluble system of real experience involving active consciousness, such that as the one is present the other is also present and neither is possible without the other. This gives us the other moment in what in this connection is a characteristic and true form of intellectual function, namely the antinomy of a contrasting opposite and wholly different character of experience from that originally assumed above, demanding as such our attention next.

To begin with, this final result has now added to our knowledge as to the true nature or meaning of the universe as it surrounds us, which can hereafter no longer be avoided. But this new knowledge is also of the character of a corrective of the original conception of nature, so that the original conception is still indispensable and in this way is also still retained. Furthermore, only in this antinomic perversion as a whole does then in fact appear the true nature of both the present conception and the original conception; for, the now recognizedly impossible fixedness of extent in the originally conceived expanse of nature is never fully so realized until the antinomic perversion has been completed, while the true character of the perverting unsteadiness in the ideal form of the present conception likewise does not appear before the completed perversion. Now, in this single antinomic movement, which we must here definitely recognize, we find also a single controlling form, that of an absolute contrast of moments in the same matter of experience, through which alone each moment as recognized receives its full reality in experience. So also the errors or inaccuracies in the originally observed data of an investigation cannot be recognized as such at the instant of first recognizing the data because these data would at once thereby be correct and not be further noticed at all, but the errors may only be recognized at the subsequent appearances of discrepancies; so that we have here again the same form of antinomic moments through which alone the essential nature of both error and correctness, and ultimately also truth, can come to be recognized. Because of the indissoluble system of these antinomic moments, the correct types, so recognized, of the observed data necessarily receive thereby the character of a form of the active intellectual function itself as a whole

involved in this recognizing process at the time in its setting the moments in a significant contrast and thus actively holding them, which also gives the category or constructed scheme of things in our understanding.

The problem of obtaining methods of accuracy in the investigations of science here now shows some of the detail in the inevitable epistemological aspect, though this is again as corrective form, that is antinomic moment, of the originally supposed practical analysis of an essentially physically inert material in nature with a consciousness analyzing it existing in parallel with it; and this is necessarily so because we ourselves are inseparably involved in the indissoluble system as a whole of the investigation as we actively undertake it. That is, we must now speak in terms of an idealism, not an idealism of independent formulation but as representing our experience essentially as a single structure as now contrasted with the original conception of a parallelistic existence of a real and inert matter of experience and of a separate consciousness containing pure ideas; for, the single act of knowing setting up this parallelism with its two simultaneous and distinct elements at once places the whole contrast of a materialism with idealism in a single unity, so that idealism and unity must inevitably appear then as a result after once merely affirming parallelism as presumedly the only thing possible rather than that this recognized idealism is an inevitable independent original conception by itself. This shows first of all how according to point of view, as we ordinarily say, the appearance of experience as a whole may change in the same observation from one aspect to that of its opposite in what is ultimately necessarily the exercise of a single and identical intellectual function; and this singleness of function is of a character to show that in a real experience it also sets up, again in antinomic form, the recognizedly distinct but indissolubly related real moments, of a matter of experience known and of the knowing of this matter, as the fundamental or ultimate but mutually dependent elements composing the whole of real experience.[1] The antinomic contrast of the known and the knowing, as indicated in the above, consists in that the known is at first found to stand out in nature before us as supposedly inert and independent material existence, whereupon under close examination it appears that this existence only stands out before us as it is so known by our active knowing such that it forms an indispensable element in this same function of knowing in that our knowing is real only by now knowing an object, this existence before us. Accord-

[1]Cf. Mach, *Die Analyse der Empfindungen*, Jena, 1906, pp. 33-37.

ingly then, as this single function, having itself reality only through the actual contrast of the moments of knowing and known, must thus unite or focus all manner, as well as the whole course, of experience in a single consciousness; so not only must this unity make the above noted antinomic moments contrasting aspects of the same matter of experience, but ultimately all of the special sciences from the so-called exact physical sciences to pure description, as exclusive of each other while appearing each complete in itself, must be found to be in truth differing aspects in an identical matter. This result then shows an inner movement in nature as it surrounds us, not of an apparent mechanical form but yet of a recognized irresistible character, and this movement with its content in its true, that is simply absolute, form has the form of the antinomy for us. However, the single movement as such, as it comes to be formally recognized as real, can only be again an antinomic moment, as such the content of speech as in the present case, by being contrasted as single ideal constructed scheme with the discrete inert existences in nature, which is the recognized form of the social reactions between an individual and his fellows in a social order; and this speech and its content with their social reference are thus the actual bearer of all real science as such. That is, the recognized individuals in a social order are themselves really the extreme antinomic moments mutually involving each other in their distinct recognition in the form of a self over against others; and this is a recognition from a present reaction, also of the character of the above noted correctives in science but now considered as individual occupation, which thus formally recognized ultimately really forms all of the conscious and conventionalized matter of experience in the content of the sciences.

In general now, the explanation of a matter of experience according to the methods of a specific science must for its reality as such a science become the occupation of a particular individual explaining the matter to his fellows such that the particular explanation is offered as a corrective of hitherto prevailing conceptions, the true meaning of all actual formulations of science. In fact, in order that any real explanation recognized as true may be made, it is of course necessary that a general condition of things shall have prevailed for the time previous to it in which the matter of the explanation did not occur but to occur subsequently then at a definite point or stage such that the original condition becomes the sustaining antinomic moment of the reality of the assumedly true explanation. This, then, makes the assumedly true explanation not merely a particular occupation of a specific individual but also makes

necessary the continued occurrence or persistence of the original condition in some actual form along with the explanation for the latter's reality, which constitutes the basis for the diversity of methods in science including, of course, the diversity between the different special sciences. As a result of this we must expect to find that, from the principle of unity in the conscious aggregation or system of experience as now found, the relationships between this principle and the essential nature of the respective special sciences, real only as specific occupations of individuals in a social order, definitely and necessarily limits the effective scope of these sciences in the observed social order to just what they are; and our problem thus becomes reduced to a statistical one of finding what quantitative relations must obtain between this effective scope and the essential nature of the science in question as the ultimate and therefore true science. A full investigation of this problem will ultimately, of course, involve in the same way also the questions of the effective prevalence of certain ideas, customs, social movements, institutions, and so forth. In proceeding to an investigation of the problem we shall need first, as is now perhaps sufficiently emphasized by the foregoing analysis of the developing antinomy, to go through an adequate analysis of the tacit assumptions and fundamental presuppositions in our conceptions of a social environment, to gain a proper basis for the necessary freedom of investigation. That is, there is already present a highly elaborated system actually sustaining us as real, active individuals so recognized, not merely by giving a real or actual character to a particular matter of observation at hand but also by shaping the course any further investigation can take; and it is this sustaining system that requires an examination next.

II. THE PRESUPPOSITIONS IN OUR CONCEPTIONS OF THE SOCIAL ENVIRONMENT

In examining into the presuppositions in our conceptions of a social order we shall first have to consider naturally what are the fundamental elements in actually conceiving of a social environment, considered particularly as real experience; for, these elements must include all accessible and determining or significant preconceptions because together forming the single system of experience as already indicated. These elements must, for our purposes here, at all times be specifically con-

sidered from the aspect of constitutive elements completing an absolute form to show that they are completely understood. Then, for the purpose of effectively studying as well as communicating from writer to reader the subject-matter of this paper, as now itself a special science and so also a proper object of study here, it is necessary to express the subject-matter in terms of the conventional forms of ordinary communication constituting and representing the social reaction involved in its prevailing or natural, and therefore intelligible, form of reality. But, as this representation of a social reaction, understood to convey a matter of science, is in itself essentially a single social reaction in which the study of a matter of science is thus but an incident part, so that the form of reaction must in itself immediately be the social environment that is to be and can be studied; and as the matter of experience consciously so recognized appears ordinarily always under the aspect of psychophysical parallelism, which inevitably must color the content of conventional forms of communication and usually implies an absence of absolute form; so, we must next consider the meaning and scope of the psychophysical parallelism continually and inevitably presupposed even in the present formulations following as they do the above Introduction, to ascertain just what is to be expected to be communicated from the conditions of communication, and to re-define the present subject-matter then in accordance with the above noted absolute form. Finally, we also found in the foregoing Introduction that the antinomy, recognized as a particular form of intellectual function and at the same time as the form of an inner movement in the universe as found surrounding us, imposes a definite and inviolable form on the matter of our experience; so that we must also expect to find here the basis for a law of change in the matter of experience, which is ultimately found to be coincident with the dialectic movement in consciousness. This law will be found to be related to the principle of statistical enumeration and average and to the principle of correlation of variations, and through these relations to have ultimately a determining effect on the structure of experience in the observed social order.

1. The Fundamental Factors in Conceiving of a Social Environment

In considering here first the elements in the conception of a social environment we have, as the most fundamental, consciousness and its object. In the conception of a social environment consciousness has, however, already the specific

function of understanding a greatly elaborated matter of experience; and this understanding consists essentially in constructing things in the environment into a single continuous scheme. Through this schematization the matter of experience becomes a conscious content of understanding, which upon recognition then still appears to us as a separate outer environment in the active construction of which we recognize a particular consciousness. The formal aspect of the development of this conscious content we must consider first as to its process. After this we come to consider how this conscious content then constitutes the observed social order in which an individual reacts with his fellows.

A. The Development of the Conscious Content of Understanding

When we see a meaning in books of science, in the pronunciamentos of authority, in the promulgated constitution of our state, this is an interpretation through our understanding essentially based on an indispensable past experience giving, as we ordinarily say, the necessary training for the understanding. For, the book, the pronunciamento, the constitution, as first presenting themselves, are a mere physical occurrence in nature; but as so recognized they also bear certain forms which are recognizable as the recurring forms of a past experience, and their repetition in the present instance is with particular reference to conveying the meaning they accumulated in this past experience with an added meaning acquired by present association. Thus in all three of the above instances we happen to have words with such an accumulated meaning brought together to form a continuous discourse for us. This discourse is then further delivered under certain significant attendant circumstances; but the discourse and the attendant circumstances thus brought together into a single scheme in understanding receive an added special meaning through the mere schematization which they could not have apart and out of the scheme.

Now, the actual construction of that continuous scheme of an experience so recognized, constituting the ordinary clear understanding of a matter of experience, is simply the process of passing from a condition of discreteness of a number of different things inertly existing in nature, mysteriously compelled in their discrete appearance before us, to a condition of recognized continuity of the things to form the single scheme; which has been sufficiently illustrated by example in the Introduction to show how this is accomplished in detail. This scheme inseparably comprises all of the experience, so that

the further introduction of an efficient mediation anywhere no longer appears conceivable or possible and thus also removes all probability and possibility of mysterious change. This process of actually passing from discreteness to continuity in the matter of experience is accordingly the essential factor in the developing certainty of positive science. This schematized conscious content of science, constituting the conscious guide of our activity in nature through the certainty of its conscious form, is as science furthermore a conventionalized experience through the general acceptance of its forms of reality with a constant meaning in the social order, being then also at its final acceptance always in the form of a formal corrective of previous conditions of the science. All formally accepted knowledge as formulated into science has thus ultimately always this social bearing such as to make it really also a social knowledge or knowledge of our social organization. And finally, the continual bringing forward of a new matter of experience out of the contact and reactions with the social environment, through these continual formulations of our experience into science which brings the matter into a continuous scheme with previous experience, results in the continued construction of a more and more comprehensive scheme of a continually more clearly understood social environment.

From this we can see now that any matter of experience so recognized at a given instant always comprises the two constitutive elements of an extensive scheme, which is past experience in the form of content of memory, and of a discrete detail, which is present physical existence now being brought into continuity with the scheme that is now content of memory. The whole of the present existence with its added meaning derived from the past thus constitutes essentially a continuous course or series, beginning at a point in the past and running up to, and including, the present physical existence as the culmination of the series; and it has a form showing on the face of it that its unity making it this series can only be in the actual knowing of the instant. The finally resulting scheme, as the conventional and conscious content of science, becomes as such also the content of the expressed speech in a social relationship, as in the present written discourse incidentally distinguishing writer and reader, in which the recognized scheme of experience ordinarily appears to both writer and reader as a system of detail having unity necessarily in actual knowing. For each individual involved in the social relations represented by the discourse, the unity in knowing appears as over against still other similar and distinct systems of experience with each having unity in its own independent knowing, and

in this understood grouping these distinct systems form the recognized social environment. To be actually so recognizable these various systems must, however, fall within the single known object of one knowing or one consciousness within whose unity alone a comparison may distinguish them as now severally present; so that the systems of recognized different experiences must in fact be coincident spheres, such as to amount to being but differing aspects in one fact of experience as object of one consciousness. But this one consciousness affording the real unity of this whole matter in a knowing from the nature of things must always elude its own recognition as something really present; for any particular consciousness found present and supposed to be this ultimate unity will at once as such take its place among others in a true unity in knowing that has just eluded actual recognition. This relationship of different systems of experience, within which only by a recognized mutual exclusion a specific experience, may be recognized as such, is thus the indispensable civilization in our social order under which we come to live as distinctly recognized individuals; and the recognition of this relationship in civilization to give conscious capacity to act in social conformity constitutes the ordinary culture.

The fact of variations of culture in different ethnic groups, contrasted with the constant forms in all of them after the analogy of the constant form persisting throughout the change in an environment to constitute life, should show us now the essentials in the forms of culture which ultimately build up the civilization forming the group of individuals. Ethnological investigation seems so far not yet to have attained a definite and a conclusively clear position as to what must be considered the source of the impulse towards constructing the single scheme of civilization, which so completely involves our individual existence; or as to what are afterwards the conditions necessarily determining the forms of the civilization. For, ethnological writers have been maintaining, on the one hand, that the impulse of development and necessity of form are found in the conditions of environment including tradition and history, and on the other hand, that they are found in the essential disposition of the people or race itself. The essential nature of these two sources, environment and disposition of self, is ultimately that of the known object in our experience and of our active knowing at the instant respectively. Moreover, the essential nature of these two is such as to make each totally dependent on the other for its very reality; so that, to begin with, they form together an indissoluble single fact as uch immediately inclusive of all determining conditions. A

variety of forms in culture and civilization can then not be the result of accidental, foreign influencing conditions shaping the forms within the single fact; but the single fact of the culture and civilization, in which a knowing and a known as self and environment are the fundamental elements of real experience, must also be found to comprise the constant and changing forms as significant contrasting moments. The variety of form in civilization, appearing particularly in the varied conceptions, beliefs, habits, customs, and so forth, of different peoples, should then form but a part or element of the truth, that is, represent a variegate functioning of the same general function of civilization as such ultimately still bringing all peoples into one social organization. We may note off-hand that, unless there is such a relationship between these variegations and a universal socializing function of civilization, so that the variegation is merely found to result from a single uniform ultimate function under diversity of conditions that reveal by their very diversity the uniform ultimate function, we can never be sure that we can and do understand not only the civilization of a different race than our own but even the words of our neighbor within our own race. We must, accordingly, consider more particularly these variegate forms, but now as content of our understanding at the same time placed as content in our environment, with a view to ascertaining their contribution as components in the social environment.

B. The Content of Understanding becomes that of the Observed Social Order

We will here consider, then, various instances from the recognized different forms of culture in the civilization of different peoples with a view to ascertaining the relations there must be between a conceivable fundamental uniform unity and the superficially apparent variegation, as based ultimately on unity of experience. For instance, Garcilasso reports Blas Valera's account,[1] bearing particularly on the natural environment of the individual, of one of the Incas of the ancient Peruvian race saying that the sun, as many say, cannot be the creator of all things because that which creates must be present with the thing created, and many things arise in the absence of the sun; nor would the sun, if free and alive like a creator, describe continually the same circular course as if tethered to a particular spot. Another Inca is reported by Acosta, Balboa 59,[1] as saying that above this sun, their father, there must be a mightier master compelling it to pursue eternally the same

[1]Cited by Schultze, *Psychologie der Naturvölker*, Leipzig, 1900, pp. 345-6.

course; for, if it were supreme master, the sun would occasionally turn in other directions or arbitrarily rest awhile at times. This same form of generalization appears in the Rabbinic traditions of Abraham,[1] these representing conceptions of a people historically and geographically isolated from the Peruvians. For instance, when Abraham came out of the cave where he had been taken by his mother at birth to grow up protected from the persecutions of Nimrod, upon seeing the sun shining in all its glory and lighting up the world, he accepted it as God the Creator, only to abandon it again when it set because he could not conceive that the Author of creation could set. The rising moon and surrounding stars were then accepted as God and his Host; but these also disappearing, Abraham declared, "Verily, these heavenly bodies are no gods, for they obey law; I will worship Him who imposed the law upon them." These legends report him generalizing in this manner from a number of different experiences to the same invisible God until one day in the presence of Nimrod he exclaimed, "Woe to thee, accursed Nimrod, blasphemer of God! Acknowledge, O Nimrod, that the true God is without body, everlasting, never slumbering nor sleeping; acknowledge that He created the world, that all men may believe in Him likewise!"

If now in the light of this comparison we examine the traditions of the less civilized aborigines of Oceania, though here the scope of experience of the individual is by nature more emphatically limited, we find again such generalizations of a mysterious, that is invisible, impulse beyond all changing things. Certain characteristic uniformities prevail pretty generally in the generalizations throughout this area, which seem to be the effect of prehistoric geological conditions when more extensive land communications permitted intercourse over much wider areas than at present, from which really the principal forms of the generalizations appear to have been bequeathed already finished to historic times. Thus pretty generally throughout Oceania the bird is conceived to be the bearer of a spirit of world-creating powers; and the spirit of man at death enters this same bird to be carried to some region beyond.[2] These generalizations among others, rather representative for this area, of a cause persisting throughout change include, of course, not only conceptions of world creation involving all time and existence but all forms down to a crass fetichism, which are all essentially of the nature of the spirit-

[1]Baring-Gould, *Legends of the Patriarchs and Prophets*, New York.
[2]Frobenius, *Weltanschauung der Naturvölker*, Weimar, 1898, passim.

bearing bird above, in which a spirit, while conceived to be resident in a definitely existing thing of ordinary experience probably because of the felt need of its greater reality for experience, has still creative or controlling powers of some form or other over an environment. Now, besides these additional generalizations not related to the civilizations mentioned above beyond a possible common ancestry of man, the scientist of the Aryans of today, as "heir of all the ages" has endeavored to find a single cause behind all particular forms of experience including those of civilization itself, and has likewise been generalizing by avoiding all specific forms of ultimate cause that history records for him as recognized before him. He thus derived a blind natural force, a single panurgic but completely amorphic entity, yet an entity still that might stand as an object filling all space over against and apart from the knowing and there give rise to all forms of existence.

So far we have considered a certain uniformity of generalizations from mere natural phenomena in the cultures of different peoples, which are essentially an ideal schematization of detail in experience, in the foregoing more especially the changing detail of mere environment in nature. We must now note further that in a civilization these generalized conceptions are the conventionalized content of living speech and the conceptions thereby become the common property of all members in a social order such as to give the generalizations in their real form a social aspect, which is, for instance, the only way they may be communicated in this discourse. But we must note further that this content of speech is derived entirely from our own past experience now content of our memory and thus placed by us in an otherwise rather insignificant present physical occurrence; and conventionalization consists in that all members of the social order have come to put a like content from their own memory into the same and similarly circumstanced physical occurrences. But more specifically as a real conventionalized content of speech, these generalized conceptions or schemes of things have really become for the time the recognized form of a conscious relationship of distinctly recognized individuals; and the relationship constitutes speech in the form of the ordinary explanations of one to another so as to bring the individuals by the fact of speech into a single continuous scheme in which the individuals as such are the ultimate elements. All individuals distinctly so recognized in a natural environment, in which present existence is always continuous with a content of memory, as such form part of a single continuous object of consciousness; so that certain forms in, or ways of, reaction by the recognized individuals within this sin-

gle object, and not a mere demarcation in the object the whole of which is at the time a complementary moment in the reality of the recognizing consciousness, must constitute essentially their distinctness. Accordingly, as speech is essentially the expressed reactions between individuals so that the reactions must be immediately its content, this content of speech must as such comprise the essential forms of distinctness of individuals on which ultimately again the conception of a social order must be based.

To consider, then, the reaction between individuals as it becomes the content of speech, we may note that in the first stages of a developing recognition by consciousness of other living individuals conscious like itself, we find the recognition to have the form of what has been called animism. In this form nature, particularly all changing or moving things, is instinctively taken to be alive and even, perhaps to a slightly varying degree, to be anthropopathic on a common plane with man; so that we can find persons, and particularly children, will talk to inanimate things, get angry with and scold them, even do violence to them with the instinctive purpose of hurting them. In animism the individual conceives himself on the same plane with everything in the entire machinery of nature, as seems first to have occurred to Campbell whom Frobenius cites;[1] so that a bushman finds no difference between man and animal, for instance, and believes a buffalo able to shoot with bow and arrow, as well as man, if he had one. However, with this attitude of mind there does not go a correspondingly greater absence of clearly recognized formal relationships between individuals, as on this recognition must rest the distinctness of individuals; that is, the differences in ultimate result of civilizations of different races or peoples cannot be said to correspond to a difference in amount of mental or intellectual content but must rest entirely on differences in certain forms of this content. For specifically, by the panurgic force of the Aryan scientist as the ultimate power creating all specific existences for him, among which life and mind are mere incidents along with and like the other specific existences, all things in nature about us are in the very same manner reduced to a common plane of existence just as in the other of the foregoing cosmogonic accounts, only with a different coloring or from a different point of view. Moreover, among the aborigines of Australia, for instance, the system of relationships in their tribal and social organizations, in their martial, trade and other rules, has been elaborated with

[1] *Weltanschauung der Naturvölker*, p. 394.

such intricacy though perfect consistency as to require close application and study on the part of so-called civilized man to understand them correctly and adequately.[1] So also the minuteness of detail and comprehensiveness of scope of conceptions under ancient Babylonian civilization, as revealed in contemporary records of the legal code of Khammurabi and other documents which show a remarkable social organization, commerce, industry, science and culture generally, is not exceeded in the present Aryan civilization.[2] The difference of rank or grade found in different civilizations must be traced to certain forms of conventionalization of content and not to the kind or amount of content of a civilization; because man's physical organism is understood to function normally everywhere alike in reacting to stimuli from his environment, so that the physical occurrences in nature must be given in practically the same form to all mankind.

Now, we may recognize off-hand as one of the distinguishing characteristics of present Aryan civilization, as compared with those referred to in the foregoing, that in general it tends to bring more and more successfully the civilizations of other peoples within its scope by confining conventionalizations of experience, from which ultimate generalizations of cause and unity are to be made, more and more to those physical occurrences which form immediately the basis of the ordinary commerce and industry; while the generalizations of formal or pure science are made colorless in the extreme so as to include and not to parallel the specific generalizations of all included civilizations. This formal science has been extended not only to all historical time and existence but even beyond the bounds of history by conventional acceptance of paleological records and of the laws of physical change in nature. This has now resulted in a pretty general collective or social effort, which knows no national boundaries, of constructing an infinite scheme of all time and existence with a rather perfectly clear and definitely persisting content in which every individual with his experience has a very definite and constant place, which is the basis of our actual freedom. This scheme, from the nature of the participation by individuals in its construction, becomes the conscious relationship of immutable character between individuals such as to make it the active realization of a single self-conscious spirit of which the individuals and their experiences are the real constitutive elements. But the actual mode or form of construction of this scheme among

[1]Cf. Howitt, *The Native Tribes of S. E. Australia*, London, 1904, passim.
[2]Cf. Rev. C. H. W. Johns, *The Oldest Code of Laws in the World*, Edinburgh, 1903.

Aryans is ultimately not ascertainably different from that among other peoples, as readily appears from a comparison of mythologies, cosmologies, religions, sciences, and so on, as in the foregoing. The actual process of development of the scheme, among both primitive[1] and civilized peoples, consists in placing the experience of the instant within a system of traditional or inherited culture to form the entire actual environment present to the individual such that the content of the experience actually consists in large part of what has been read into it, so to speak, out of the content of memory. No cult, creed or science can have any meaning without an appropriate previous training leading up to it to give it content; while no people have so clearly realized this dependence of the actual experience of the present upon the past, that is, are so fully aware of the progressive or historical character of the whole content of our experience, as the Aryans. This is evidenced by the monumental and now widely current conscious formulation, originated among them, of the theory of evolution in its most comprehensive sense. Off-hand the prevalence of this theory might be said to be due to knowledge of a more extensively authenticated history of the actual growth of the culture of the race; but with equal force it may be said than an historical sense, that is an inner historical consciousness given only by the content of memory, is presupposed when actually finding the authentic material of a history as such on which as its content to base a theory of evolution, since authenticity in this case must still rest on certain forms in what is otherwise mere present existence equally accessible before actual knowledge of the theory as after. This, then, shows us clearly two distinct and fundamental formative elements in the ordinary understanding of a matter of experience, namely the content of memory formed into a continuous single scheme, and the present physical occurrence in experience fitted into the scheme and continuous with it to constitute the clear understanding of the physical occurrence. This gives in broad outline also the essential character of the component elements in the conception of psychophysical parallelism in science today, which we must now consider more fully.

2. The Psychophysical Parallelism in Current Conceptions of our Environment

We found, then, in civilization a single socializing function, essentially the same for all peoples because ultimately neces-

[1]Cf. F. Boas, *The Mind of Primitive Man*, in the Journal of American Folk-Lore, 14: 1-11.

sarily forming an identity for us when actually experiencing other civilizations, of distinctly defining the individual as necessarily within, and dependent upon, an indissoluble social group; and this form of unity alone can make it possible, as found above, that differing cultures as such stand revealed, to begin with, while later they are then inevitably brought into a single scheme of civilization. For, the variegate detail of culture and the single socializing function are the two indispensable complementary components in forming the single fact of the reality of the whole; because the discreteness is necessary in the detail to enable the detail to stand out as real by contrasts, and the detail recognized as such is necessary for the recognition of the unitary function as such, a matter to be reverted to variously in the following. In the same way, then, as an individual stands out with pronounced and distinct individuality by the from of differentiation from his fellows, a given culture may only acquire a pronounced richness within this single scheme, that is not by effecting a uniformity of detail everywhere but by having each distinct culture brought into the scheme retain its differentiating characteristics. Schematization must, however, begin by conventionalizing generally certain universal supporting conditions of culture, which are collectively designated commerce and industry, to provide the abiding basis for the single civilization. The psychophysical parallelism between the physical presence of this basis and the scheme of its understood form of endurance, which can only be content of memory, then assumes ultimately by an antinomic perversion, as variously indicated in part in the foregoing, the form of the psychological problem of association within a content of consciousness forming the scheme of civilization. The physical basis of social environment in a civilization is, accordingly, to be studied from these two aspects and in the order given, namely first the recognized physical presence in parallel with a recognizing consciousness, including particularly the currently presupposed mechanical forms in the active recognition, and then the resulting continuous scheme in consciousness in the form of content of memory giving the real content and meaning to the physical presence.

A. The Inadequacy of a Purely Mechanical Parallelism

All actual differentiation of individuals within a social order must as such be in knowing in the form of content of memory; but to be clearly so, which is effected only by definite contrasts of forms, the differentiation must have enduring form, as readily appears from the character and extensiveness of the scheme of civilization, which constitutes immediately the phys-

ical in nature about us. This surrounding physical nature is off-hand understood to be a common inertly expanded ground or realm of existence for independently distinct individuals composing by juxtaposition the social order. That relationship and communication between individuals constituting their mutual recognition, moreover, by which the social order is understood to be actively established, is understood to be possible only through, or by means of, this surrounding physical nature, as it were, containing the individuals and enabling them to communicate by mechanical contact. In fact, the individuals as essentially conscious selves are really understood not to be directly so recognized but only indirectly through mechanical contact. To consider then the generally accepted forms of mutual recognition by mechanical mediation, it is assumed, to begin with, that "the whole realm of the physical, which according to experience is connected with the psychical, falls into two groups, namely the effects of natural objects on the central nervous system and the effects on natural objects (in the first place on the human body itself) through central excitation. We, therefore, find in the so-called psychophysical movement of the nerve centers the immediate and unitary physical basis of psychical phenomena. The inner nature of this basis is, however, not known and so cannot be used as point of departure. But if we proceed on the one hand from the impressions of natural objects and on the other hand from the movements of expression, we must always take into account the mediation of the nerves which indeed takes place according to law but may, of course, be the source of essential modifications of the effects directed upon or proceeding from the nervous system."[1] "In the juxtaposition of stimulus and sensation, of emotion and the expressions of emotion, of subjective comprehension and objective structure of spatial and temporal forms, we accordingly find psychophysical parallelism presented in its entire scope."[2] "The parallelism is, however, not an immediate one. Such a one could only occur if the subject lived everywhere in nature and every objective event entered directly as a subjective experience into consciousness. In that case consciousness and nature would be fundamentally the same. In reality the parallelism is mediated through the human body and particularly through the nervous system, so that only the central excitations of the cortex of the large

[1]Lipps, *Grundriss der Psychophysik*, Sammlung Göschen, Leipzig, 1899, p. 32. These quotations are here made to obtain a representative formulation of the current conceptions of psychophysical parallelism by a well-known writer on psychology and not by the present writer himself.

[2]Lipps, *ibid.*, p. 31.

brain correspond directly to the processes of consciousness."[1] Now, where we find in our investigations the two distinct and entirely disparate elements of consciousness and nature as above, between which a relation of knowing is found to obtain by which the former ascertains the true nature of the latter, this relation must have, of course, a real mediation. But for scientific accuracy the above formulation presents still two serious defects. For, in the first place, with a distinctness of the two elements of consciousness and nature after the manner of the above formulation, the body and particularly its nervous system actually performing the mediation as understood in the above cannot occur in any experimental investigation among those things in nature as we actually know them by seeing, feeling, hearing, and so forth, as assumed in the foregoing formulation; because what so occurs among the known would actually be known through some other and the true mediation. And then again, from the mode of disparity between consciousness and nature, the body supposedly found in any experiment to mediate in the relations of consciousness and nature is really, as actually so found, a part of nature such that for its own recognition it likewise requires a mediation as yet unascertained. The net result is simply that the mediation between these disparate elements in our existence must be understood in different terms not yet brought out here.

These results now present to us certain difficulties derived from the above formulation of a conception as to how experience is understood to be realized; and in order to trace the exact source of the difficulties, we shall need to examine more particularly the experience itself whence the conception is derived. But, to follow up these formulations a little farther first, we note that, "as the physical world consists of natural objects and the psychical world of contents of consciousness, psychophysical parallelism, whatever its form and conditions, must rest on a juxtaposition of content of consciousness and natural object. The problem now is, to find how this juxtaposition arises and by what means made possible. For this purpose it is to be noted that the parallelism of the physical and psychical can be considered under two aspects. This appears when we consider that man stands both as a recognizing and as an active subject over against the natural object. The recognition of an object presumes a perception. This gives us a juxtaposition of consciousness and natural object which are thus placed in an out and out parallelism for the reason that both have their common source in the originally

[1]Lipps, *ibid.*, pp. 29-30.

given. . . . besides the subjective spatial and temporal conception an objective space and time determination appears and, . . to the content of imagination constructed out of sensations, corresponds a spatial system of substance elements. . . . The parallelism that appears here experience teaches is mediated by the human body. For, objects are only then perceived when they act upon the substance of the body and when this body takes up the impressions received and conveys them as sensations to the perceiving subject."[1] This formulation of the conception from our ordinary experience, particularly in the last sentence, will now give us the source of the difficulties. For, it appears that, to recognize the parallelism, we must actually find two distinct forms of the same thing in experience; while of the two forms, despite their being both necessarily known at the same time in order to be differentiated as two, one must nevertheless be found to have immediately the form of being in nature and the other to have the form of a content of consciousness. Accordingly, both nature and content of consciousness must be on the same plane for a comparison as such before a kind of superior knowing holding aloof and thus not recognized here. This knowing, then, from its character of ultimate unity within which differing elements of experience, like nature and content of consciousness, are contrasted for distinct recognition, can itself not be in the form of a thing among others as this would reduce it to a mere distinct portion of the object known. We shall need to investigate more fully, then, how this mode of differentiation, of elements thus necessarily on the same plane, essentially leads to a conception of psychophysical parallelism.

To trace out the actual mode of this differentiation, we would ordinarily go to reports of actual laboratory experiments in which the parallelistic conditions are specially recognized. At this point, however, we with difficulty find an appropriate material in the representative literature for the field of psychology, or for that matter elsewhere. The nearest to such material is the rather large number of accounts of experiments with what constitutes simply the physiological functioning of the nervous system as exhibited in reactions to specially devised stimuli under conditions controlled as far as possible; but what uses might still be made of them if in proper form, their forms of description leave them entirely unavailable for the present purpose. For, in describing in all these experiments the stimulus in nature understood to be apart from consciousness and to cause a sense impression bringing a content

[1]Lipps, *ibid.*, pp. 19-21.

into consciousness that represents the stimulus then as thing in nature, the description never indicates just how the fact, that a real stimulus is in nature as distinct and apart from a content of consciousness, comes to be so recognized;[1] but this duplication of form must appear somewhere in order that we may attain the actually conceived distinction between nature and content of consciousness. Now, the stimulus actually found in nature is not, and according to the foregoing conceptions in fact never can be, recognized except in the form of one or more sensations; and where, for instance, we speak of the touch sensation of a thing in nature seen touching our skin to give the sense of hardness, coldness, smoothness, and so on, of a bell seen also to be struck to give a sound to our ear, we see the thing in terms of color before us; and seen as such while, for instance, not visibly touching our skin, it is as a rule naïvely taken to be in nature apart from consciousness.[2] But we must not overlook the fact that the whole light realm about us is the active functioning, at the time, of the sense called vision in which the variegations appearing as things in nature occur. In comparing now the recognized things as to their characteristics of inner and outer occurrence as referred to the knowing consciousness, we must note, to begin with, that the different senses of sight, hearing, touch, and so forth, give each in their functioning a distinct realm of such a nature as never to become fused at any point; so that the comparison of these sense realms to show their distinctness and sumultaneity can take place only in an indefinite, intangible unity, yet a unity that is positively and immutably present as evidenced by the fact of the actual comparison. This unity in the comparison, from the fact that by it the different sense realms stand out with distinctness, is then identical with the active functioning of consciousness; and within this comparison must be comprised alike both the distinct thing in nature and the content of consciousness that we find, whereas the sense realms and particularly the detail in them obviously may have alike either the form of distinct thing in nature or content of consciousness according to circumstances, though only one form at a time. Accordingly, a certain fluctuating movement must take place in the active comparison, immediately giving the character of inner and outer occurrence alternatively to the sensations, the

[1]Cf. e. g. Külpe, *Outlines of Psychology*, 1893, Trans. by E. B. Titchener, London and New York, 1895, p. 48, 78 ff.; also Merkel, *Die Abhängigkeit zwischen Reiz und Empfindungen*, in Wundt's Philosophische Studien, vol. iv., p. 541 ff.; also Wundt, *Physiologische Psychologie*, Leipzig, 1908, Bd. I., p. 420 ff.

[2]Cf. Mach, *op. cit.*, pp. 9-14.

same as that giving the antinomy noted before; which shows that the ordinary conception of nature as having hard and fixedly extended form, while sufficing for a limited routine experience, is no longer adequate for unrestricted scientific analyses.

B. The Unitary Dialectic Movement comprises all Factors of Observation

That the same thing in nature may at different times appear as within or without the unity of active comparison by which the thing presents its distinctive qualities, in which the unity is ultimately identical with consciousness, it must under some influence be made to assume a varying aspect giving successively these forms. Thus, to consider now specifically this influence, I see the bell struck at a distance off and I hear the sound, or I approach and touch it and feel its hardness. The original recognition of the bell, in terms of a color variegation but with the fact of its color as such rather ignored, is then taken as giving the form of being in nature, while the sound or hardness recognized at the same time is usually taken in that connection as being content in consciousness. If the bell is out of sight, the sound heard or hardness felt may then appear to be something in nature, depending on point of view or attitude of mind. But recognizing the visible bell specifically as a color variegation standing out as such in nature only when it also comes before our eye, it begins then, when seen, to look as much as a mere content of consciousness as did the sound and hardness noted above.[1] Here we find the fluctuating movement to depend on a certain character of the inner nature recognized at the time in the thing, in whatever sense realm the thing may happen to appear. The particular character of inner nature having this influence is, moreover, the fact that the form with which alone the thing stands out before us is found to be a quality dependent upon a certain activity within the sense realm by which the whole realm including the thing in nature appears immediately to be a single active functioning of the sense. Thus on covering the eye we find we blot out the particular content of the realm of vision then present; and this, while at the first instant suggesting the curious possibility of separating a portion of the functional realm from the rest, by way of emphasis from the contrast then first calls to mind the fact that the thing seen standing out at a distance also implies immediate contact with that before which it so stands out. That is, it is this contrast when observed that constitutes the

[1]Cf. Mach, *op. cit.*, pp. 18-23, 31-32.

active influence under which the inner movement from thing in nature apart from consciousness to content in consciousness takes place.

But here we must contrast a little more particularly farther the two now distinctly recognizable component elements in the thing in nature, namely the physical or fact in experience and the metaphysical in an Aristotelian sense of following upon, but also derived from, the physical. Thus the inner movement noted above, which from its character is identical with the dialectic movement in ordinary thinking, appears only from a certain series of physical occurrences; and it thereupon reveals itself to be the unity within which is constructed the entire scheme of nature about us. This construction causes the things in nature to appear successively and unavoidably under the two all-inclusive aspects of thing in nature apart from consciousness and of content in consciousness; so that throughout this constructed scheme the thing has consistently the character of a uniform physical occurrence determined by fundamental psychologic law. This constructive inner movement has all-involving scope. It is through this same movement that "the astronomer must recognize that, where the stars are scattered like luminous points over the dome of the sky, an immeasurable world space stretches out through which immense heavenly bodies pursue their course. So the chemist finds it necessary despite appearances to conceive of bodies as consisting of atoms in order to understand the laws of their decomposition and composition. Accordingly a world constructed by thought takes the place of the one immediately observed. In the first we recognize the true nature of things while the second is volatilized into a mere appearance, of value only in so far as it makes possible the recognition of the true nature of things. This appearance arises, as we say, in that nature becomes recognizable through the impressions it makes on our senses. The sense perceptions are thus the signs through which the inner character of nature is revealed."[1] The inner nature so revealed, in both macrocosmic and microcosmic form and both necessarily of endless scope because of the continuing dialectic construction with continued consciousness, is, however, as indicated in the quotation, entirely a metaphysical construction out of a preceding experience by the dialectic of thinking. This metaphysical construction in thinking, like in the case of the senses above, gives also a distinct functional realm in the form of memory and its content. But this realm differs from that of the senses, which from their

[1]Lipps, *op. cit.*, p. 9.

complete distinctness require and reveal a unity in a non-appearing consciousness, in that it has a content called the past so that it makes the unity in consciousness, of this content with the totally disparate present content of the sense realms, appear as a persisting self knowing the whole. Now, anything specifically recognized, that is as this thing, always has the form of something which by its specific form excludes an environment of something else; and the unity as persisting knowing self recognized as our self, or really my self, that is this self, has likewise the specific and exclusive form of a plenum containing my real experience contrasted with an endless void as an environment of not my experience from which the plenum stands out. This plenum stands out indifferently as to any conceived or presumed absolute size or location anywhere, because the whole contrast is relative to the active dialectic of thinking.[1] But both the plenum and the void are here again the opposite moments in an inner active dialectic movement and unity which is thus the actual but undiscoverable self really knowing back of all; and in the inner dialectic movement of this ultimate knowing is then also immediately involved the recognized and real communication between different individuals of a social order. Accordingly, all law, whether natural or psychic, because it is really the form of the above noted inner dialectic movement, is ultimately psychologic in character; and this universal or single characteristic becomes thus a real categorical imperative for science. This categorical imperative is thus essentially apriori but, from the metaphysical character of its actual forms for us, being recognized only from a succession in actual experience showing a unifying action of the dialectic function, it has always an aposteriori character when recognized; and it is this apriori condition of function and aposteriori discovery of the condition that gives the antinomy regarding innateness of ideas.

To obviate, then, a fundamental defect in the analyses of present science, we must now recognize as primal for such analyses that the surrounding universe actually moves in a manner totally different from that understood by the famous words, *Eppur si muove*, "and still it moves," reputed to have been uttered by Galileo at the close of his trial for heresy for urging the acceptance of the Copernican system. To begin with, this motion of the universe, like in fact all motion recognized at any time and place in our experience, cannot be a complete passing away of actual existences present as off-hand

[1]Cf. Poincaré, *Science et Méthode*, Paris, 1909, p. 95 ff., on relativity of space.

understood, which would really give fixed momentary existence without noticeable motion contrary to experience; as for instance, in the moving railway train with its motion actually seen as such. The recognized motion requires an actual preservation of successive forms of the existence such as to make the change appear by an actual comparison of the successive forms.[1] Accordingly, for the recognition of movement or change there is at the same time required a continual construction of a certain fixed scheme of things in nature out of which the change then really appears, the basis of a continuous experience as such. In fact, all science, the content of our every-day speech, cults, creeds, and social institutions generally, our whole conscious experience, is just such a construction of an ideal fixed scheme of our universe out of a continuous movement such that neither could exist without the other; and this relationship constitutes the sustaining metaphysical structure complete of the unity of contrasting complementary elements, which alone makes a real experience possible for us, a structure that cannot be found as some existing thing in nature but only as a principle.[2]

In view of this result so far, how shall we appreciate the results attained by telescopic compared with microscopic vision and especially both of these compared with ordinary vision? So for all the other senses aided and unaided in observation. In the first place, a thing is only understood complete in detail as its successively observed component parts, found in one way or another in an actual experience, have been constructed into a single scheme, as that noted above, to constitute the recognized thing. So, in using special apparatus of one kind or another in connection with observations in nature, the apparatus, first by itself in its own construction and then in its operation in actual observation and inseparable from the observation, is also such a scheme derived from a course of experience. Now, while in science as well as in ordinary experience we have, in understanding, always the construction of a continuous scheme of the matter understood; we have in formal science, moreover, by extremely conventionalizing certain matters of experience, laid emphasis on the conscious content of our experience presumedly to understand, that is of course to schematize, all things of experience clearly, though essentially and unwittingly the emphasis has effected a more thorough and extensive conscious organization of the whole social order

[1]Cf. Gray, describing a machine that measures character on the basis of persistence of sense impressions, in Knowledge, London, Dec. 1910. Abstract in The Literary Digest, New York, Jan. 7, 1911, vol. 42, no. 1.

[2]Cf. also Mach, *op. cit.*, p. 105 ff., on spatial sense in vision.

through the conventionalizing effort. Accordingly, the distinct conventionalizations of science are likewise brought into one continuous scheme to constitute then the discourse of individuals in a social order; in fact, our whole social organization, like formal science, is the conventionalized result of a continuous development by successive corrections of previous conventionalizations, in which a specific preceding matter corrected always forms an integral part in the subsequent correction, that is specifically in the present in which essentially the whole process of correction is schematized. In this way also the present conventional formulation of the conception of a single dialectic movement as unity of all factors in experience gives the conception the character of a corrective of the original conception of a mechanical psychophysical parallelism, such that thereby this original conception of the psychophysical parallelism becomes an indispensable sustenance to the present conception. The schematized content of present science, as a conscious form in present social organization, must thus become a factor in determining the next step in the present formulation of a matter of science, because it forms the unavoidable present environment of the reaction leading to a new formulation as just indicated in the last two sentences. And for these very same reasons, whether a certain individual will undertake the formulation of a given science or whether he will leave it to others will depend on his interests as developed in his individual past, since the fact of such diversity of interests of different individuals and its results is already presumed by the actual conventional formulations of matters of science by individuals; so that the general status of the individual contents of memory, that is past experiences, of members of a social group collectively will be a further factor in determining what science shall come to be developed among them. This determining factor so directing the development of science, therefore, must become the real force in the usual ultimate physical basis of science that determines the course of the dialectic movement out of which alone science arises, as variously illustrated in the foregoing; so that the necessities arising from these sources, as issuing in the dialectic movement that produces scientific formulations, must prove to be really the natural laws as discovered in science. It is, then, natural law as derived from this source that must receive our attention more fully.

3. The Law of Change in Nature as Related to Dialectic in Consciousness

We have, first of all then, found an ultimate medium of communication between the recognized individuals of a social order, which is necessarily a single identical inner movement and the unity of all matter of experience, dialectic in character and not ascertainable as an existing thing in nature. This unity in an ultimate medium of communication appears immediately and only in the conventionalized content of the living, every-day speech and more particularly at that point where the conventionalization through its conscious forms develops into science. The communication through this medium, as already noted, consists in that the communicating individuals are immediately reciprocal or mutually dependent moments in the single inner movement as dialectic; and this relationship, between the actual elemental factors recognized in the communication, as the true unity of experience, also implies an ultimate identity of the selves as recognized in differing individual experiences in which any actually recognized self as over against others is but one of the moments as noted above. This identity, as the actual form of that continuity in the communication when no further mediation is understood to be required beyond that actually recognized, appears such from the fact that identically the same matter of experience conventionalized for the speech in the communication is at the same time matter of experience for both communicating individuals such that only a difference of aspect constitutes distinctness of content of experience for each. Now, the conventionalized matter of experience forming the content of science, which is ordinarily understood to be based on an independent material existence having also independently its own form and character that our experience is compelled to follow, was in the last (2) section found to comprise immediately all material existence ascertainable and thus to reduce all forms of existence in our experience to an indissoluble relationship with our actual consciousness of the existence such as to make the relationship also a determining force in the forms and character of the existence. Thus, for instance, that detailed matter of experience, forming in association the discourse comprising not merely the uttered word but also a social and natural environment in which one individual speaks to another, requires a unity in actual knowing at the time to have the meaning it conveys from speaker to hearer; but furthermore, the unity in knowing and the meaningful discourse as such would both not be recognizable if at the same time the detail involved

were not also so recognized. That is, the unity, to be such, must be the unity of an included detail of distinct parts so recognized, and vice versa. In experience the detail has the form of a succession of physical occurrences such that one instance or event in the succession is present while all the rest is excluded as past; but the whole is at the same time held in a unity in the actual knowing by a self to form the complete succession as such and to give to our experience the form of an expanse or extent in nature, or according to point of view, the form of a course in time. This, accordingly, presents two all-inclusive opposite aspects in a single fact of experience, namely as expanse of nature and as content of memory, the essential form of real experience. But because of these relationships, the physical occurrences have also inevitably imposed upon them a certain form required to become a conscious content of experience; so that this imposed form makes all forms of physical occurrences identical with pscyhologic law for us and thus constitutes the inevitable categories or classes under which the detail forming the succession of things is grouped. It is from this point of view that we must now examine the forms of things in nature.

A. The Essential Mode of Variation of Things in Nature

The analyses in present-day science are essentially those of things in nature that occur as serial detail in our experience. These analyses, made primarily to reveal the form of continuity in the general scheme of things to constitute their understanding, then consist in ascertaining the relations of instances or events in a succession, which are, of course, the relations in the form of a comparison of parts through unity in knowing, already noted, and these relations formulated algebraically. Thus we have a certain thing, and its qualities more specifically are as large, or so many times as large, as those of another, or constitute an addition of a certain proportion to something gone before; and so on. Then, to make the scheme of things perfectly continuous in all directions for clear understanding, as is ultimately possible since our experience by being a single experience falls in the same unity through a single knowing, the analyses must reveal a continuity not only throughout the same sense realm but also in passing from realm to realm of the different and distinct senses as well as to the distinct realm of memory. To consider first the continuity in the same sense realm, this continuity is usually realized for us in a gradual transition from one distinct form recognized in the realm to another form, by artificial means of course, such as to show an identity of sense function

in both forms; while the distinctive character of the forms has then a quantitative basis as indicated just above. This transition in actual experience is along a scale of infinitesimal gradations such that the sense forms then appear definitely and permanently placed upon this scale. Thus a continuity between different primary colors is produced in the continuous spectrum with its infinitesimal variations; similarly we have gradations of intensity and saturation of single and mixed colors, and so on, the continuity in the gradations showing the whole to constitute, in the form of just noticeable variations in the single realm of light, the active functioning of the single sense of vision. Similar continuities in gradations of form we find for all other senses.

But in considering the continuity between different sense realms, our analysis must go in an entirely new direction; for, the continuity can there no longer be in terms of infinitesimal gradations of forms like those of a single sense realm, since from the nature of their distinctness the necessary fusion of the sense realms can nowhere be found, to begin with. If, however, a continuity is to appear such as to lead again to the appearance of an identity in some function, as in the above instance of color, while no transition by gradations of form from one into the other is possible; this continuity between two and more sense realms, already seen off-hand to be in some unity from the fact of their comparison or contrast in actual knowing at present, must then appear from an unvarying one to one correspondence between two or more series of parallel events in the different sense realms. As each series is wholly within a different sense realm, it must for the correspondence maintain throughout between the differences of its successive members and the differences of the corresponding successive members of the other series a constant quantitative relationship formulated algebraically to show that no foreign and unrelated event had been, or could be, introduced at any point in the series, such correspondence revealing for instance the logarithmic law of quantitative variation of the successive members in some of the parallel series, first formulated by Weber.[1]

We will undertake here a study of experiments on such corresponding parallel series, but carry out this study in the manner already indicated in the foregoing section, with a view to showing the character of analysis that alone can discover the essential factors in such experiments. Thus, we see a certain color variegation, which we ordinarily speak of as a weight

[1]Cf. Külpe, *op. cit.*, p. 163 ff.

placed on our skin, and we find at the same time a sense of pressure resulting. If now we effect a continual change in the pressure so that we get a gradation of successive just noticeably different distinct pressures, then actual experience shows that the relation between the visible forms for a given pressure and the amount of change in the forms for the next succeeding pressure, as measured by somewhat complex comparisons that appear off-hand to fall entirely within the single realm of the visual function, remains practically constant when expressed algebraically; though as a rule the amount of change found in the altered visual forms is considerably more than a just noticeable difference. Similar relations can be found to obtain between these visual, or also tactile, forms and still other sense intensities including brightness of light or color itself. However, we must note here now especially that, in the correspondence of such parallel series, the measurements in that series having the measurable or finite differences between its members are made by a more or less extensively elaborated apparatus; and this measuring apparatus complete, as understood in connection with the actual quantities measured, comprises always an accumulated experience of considerable extent.[1] The recognized structure in the apparatus, as including of course really the thing of experience measured, accumulated out of a past experience but ordinarily not recognized as so derived, constitutes an hypothesis introduced into this experiment in the same way as hypotheses elsewhere are introduced in the positive sciences. Likewise the color variegations, recognized in the visual realm of the above illustration as the weights, have an hypothetical element, namely the inner substance in which inheres the weight ultimately causing the pressure sense. We must, of course, examine more in detail these hypotheses in the apparatus and stimulating weights to see what part such hypotheses constitute in the ultimate single continuous scheme of all the parallel serial occurrences in the different sense realms forming ultimately a single serial occurrence.

To begin, then, with the weight as seen in the visual realm placed on the skin to give the sense of pressure, this placing of the weight is as far as seen, as already noted, only a certain color variegation. We have further noted the apperceptive or metaphysical character of the substance and weight in the weights as seen. Here we must consider more specifically the ascertainment of the algebraic relations between the quantities of the successive weights, based on both their physical and

[1]Cf. Mach, *op. cit.*, p. 34.

metaphysical elements, that describe their character as appearing in the visual and tactile realms. To obtain the continuity of scheme as such which shows a matter to be fully understood, the matter must be considered as falling entirely within and involving some single functional realm, the differences in the quantities being here for instance understood to be all in the visual realm. Thus the quantity of the weight as seen in the visual realm is really seen in certain displacements in the realm as referred to a scale of distances. Whatever the form of the scale, it essentially consists of a succession of unit quantities of conventional form permitting a comparison of scale and thing measured in the single perspective of one sense realm to show that the given weight used has also an aggregation, but of a specific number, of unit quantities. These measures involve both the results of the so-called exact measurement giving an exact quantity and the results of an off-hand view of the thing measured. For, the latter method alone cannot give appreciably more "exact" results after the application of exact measurements to a given thing than before; but the "exact" quantity resulting from exact measurement is in fact the memory of a succession of steps in a particular process constituting thus an extended course in experience. Yet in this exact measurement the distinct steps in the process, as the ultimate component units, are again only ascertained by a mere off-hand view of the matter; so that from the nature of things no ultimate exactness is ever reached, particularly as wholly apart in an inert nature and independent of active knowing as this is ordinarily understood. The ratios giving the exact quantities and their relations to form qualities are thus obtained by comparing, essentially as content in memory, a system of components in a conventional course of experience; and when a constancy in these ratios is found continually in any direction, a single controlling law is inferred. As the fact of comparison to show the actual distinctness of a form for us, not only of the successive members of the same series in the same sense realm but also of different series in different realms, already shows the unity of the whole; the constancy of ratio revealing the single controlling law then further shows the kind of unity of movement from which results the continuity of scheme in understanding as necessary to recognize the movement as such. If this unity is then taken as falling in nature, we have a law of physical science; if it is taken as a unity in actual knowing, we have psychologic law, the physical and psychological being antinomic aspects of the same matter of experience. This gives us, essentially, the antinomy regarding exact measurements of things as supposedly occurring inde-

pendently in nature but here found to be just as much in the active knowing from which it is ordinarily supposed to be independent.

Accordingly, the accuracy, forming the basis of exact positive science understood to reveal exactly the laws of nature, is in its essential nature a metaphysical structure, exact just because it is a metaphysical construction out of a process and because it is, as such, the antinomy, in the form of a corrective, of the ordinary view of things found not correct. This metaphysical structure, as variously indicated in the foregoing, is essentially of the form of an accumulated extended course of individual experience, such that with any part omitted the action of law, appearing necessarily in a continuous scheme for us, cannot be so recognized. As we already find in ordinary experience that all discoveries in science and the arts are only made in due course of time, we here further find that the particular character of the result of an investigation into the nature of a thing must ultimately appear to us to be dependent on a certain selective activity in the dialectic movements of the individual consciousness formulating it; that is simply, the appearance of a thing varies with our past experience with the whole or any parts of it. Now, by the express character of corrective of prevailing conceptions essentially inherent in the special formulation of a matter of science or of ordinary experience, we come to find in our experience a diverse development of content of experience for different individual consciousnesses forming by its diversity a social stimulus and the direct occasion for the communication of science in speech. This divergence in content of experience, while serving to reveal the actual unity of environment in the speech of the resulting communication, has for us in every-day experience, however, the form of absolute discreteness of particular thing and of individual consciousness, because the necessary continuity of scheme as going with its understanding is there wanting because of the absence of understanding; so that the diversity, as it ranges from one extreme to another in individual experiences, has for us at the outset a purely statistical character. A constancy through this range of diversity will again have for us the character of a law as indicated above.

B. The Relations of Variation to Selection in Dialectic

The fact of educational effort, including all such things as this discourse, immediately implies a diversity in intellectual results which need to be so harmonized as to produce that continuity of scheme of the social order in which different individuals are enabled to communicate; that is, the education aims

to provide the necessary basis of an organic social order by which can be conveyed certain particular conceptions or conclusions like those of this paper. But the mode of presentation of the content of such discourse also presupposes an actual unity of experience such that the active conveyance of the content, to make it possible, may be realized through an identity of detail of experience for both writer and reader, namely the paper bearing the written word; and the identical detail must within its limits have the same meaning for both, though derived by each from his own past experience, in order to communicate any intended meaning. This is the case with all educational effort. In regard to this likeness of meaning in an identical detail of experience for two individuals, who nevertheless recognized the conceptions or conclusions of any given piece of discourse one at an earlier time than the other, we must note here further, as noted before, that the diversity is a fundamental condition in the actual recognition of the unity of discourse and of social environment; for, this unity shows itself, in the form of meaning corrective of previous conceptions, through discourse such that its content as meaning is as unavoidably evident to the reader after actual delivery as to the writer himself even during the whole time, once both have brought together the necessary supporting detail in their own past experience. This diversity ordinarily appears, then, as the chance occurrence of a varying detail in our individual experiences giving a varying meaning from the varied association of detail; through all of which under social contact and stimulus, nevertheless, the understanding of the same continuous scheme of things must gradually and irresistibly develop for all individuals in a given experience as the same association of detail is more and more approximated by all. Accordingly, the formulation of science by the individual, however accurate in itself, is really but a word that he speaks to his neighbor in a social order; while this entire social relationship, comprising as part this word spoken to his neighbor, is the real truth assumedly sought in the individual formulations of science.

Since we find here an inevitable divergence in individual formulation of the truth that necessarily determines our experience, we must begin by investigating the limits of the divergence. Thus to begin with existence itself, we may note that for a thing to stand out as existing in nature before us, under whatever conditions this be, it must stand out by contrast with its environment to get the definiteness of outline it has. For if, for instance, this page of white paper and the things in its environment together with all intervening space

intervals were uniformly white, I should not be able to recognize the distinctive forms of this page and its color nor, of course, any other forms or color anywhere else. Then, the existence of this page of white paper, as now actually present, stands out as such in contrast with its environment, as content of memory of a past; so that furthermore, because of the nature of the recognized past experience serving essentially as environment to contrast with a present, the present existence of the white paper before me must have begun so to exist before me at a more or less definite point in time before which the past was present. This shows the necessity of a certain change movement as the basis of the recognition of an existence as present before us as distinguished from the past or content of memory; and this movement, as affording the basis of real existence in experience, gives at once the above noted diversities of distinct individual experience because this is the essential form of real existence of individual experience. Thus, I recognize my individual knowing self, before which, as distinctly my knowing but of course not as a known thing among others, things stand out as present existence; and, since my knowing is not an objective thing for comparison with others, it can have its distinctive character for me solely in a form of social reaction between myself and others showing, for instance as I then understand, that things present to myself are not being recognized as present by other individuals or other things than the present are being recognized as present by them. That is, in order that out of the indissoluble and complete system of the reciprocal or complementary moments of a knowing and a known there may appear the distinctive character of my knowing over against that of others, there must be, simply to provide the necessary contrasts for real existence of my self, this peculiar form of social reaction between recognizedly differing individuals while still necessarily comprised within one and the same single indissoluble system for actual recognition. This recognition of a number of individuals, understood to be severally conscious like myself and placed visibly in various positions side by side to form a social order, is thus a construction out of a number of associated details of actual experience, very similar to the construction of definite spatial position out of various details whereby a thing actually seen is understood to be a distance off from our conscious self.[1]

Finally we must note also that with the variations goes a

[1]Cf. Wundt, *op. cit.*, 1910, Bd. II., p. 626 ff., on the structure of space in experience; also Mach, *op. cit.*, p. 105.

chance occurrence and recognized discreteness of things, the form in ordinary experience of distinct and real existence, in which the unity does not appear as an object. However, this chance occurrence of detail must as such still fall within certain definable limits[1] where diversity, besides calling out the social reactions on which recognition of unity is based, will really still make possible actual communication between individuals and out of this ultimately permit a conscious construction, in understanding, of that continuous scheme of things in nature constituting a recognized social order. As this continuity of scheme cannot appear as a continuity of object,[2] since it would as such obliterate the diversity necessary to the ordinary conscious individual experience; the continuity can have only the character of constant algebraic relationships of distinct quantities for us in every-day experience already referred to, appearing as such from a statistical classification of detailed matter of social experience. But further, as we recognize that science as a reality is necessarily a specific formulation by individuals upon appropriate social stimulus, such that the conditions of individuality of the formulation must also determine the effective scope of the respective specific sciences in the social order; we must also note that, while the individual formulation gives us the basis of all law and unity immediately attainable in a given individual experience, these algebraic formulations of conditions become ultimately themselves a particular condition in the validity of the natural laws exhibited in the formulations of science, which gives to the result again the antinomic form it ultimately always assumes for us in actual experience, namely as individual and social aspects of the truths of science. This gives, then, a statistical aspect to the formulations of science themselves, determining the resulting scope of their actual validity in the organic structure of the social order, which we must next consider.

---

[1]Cf. Poincaré, *Science et Méthode*, p. 64 ff.

[2]Cf. Carus, *The Nature of the State*, Chicago, 1894, p. 3 ff.

III. THE LAW OF PROBABLE VARIATION OF INDIVIDUAL EXPERIENCE IN THE ORGANIC ACTION OF THE SOCIAL ORDER

We have found that the ordinary understanding of things is a continual bringing of an additional detail of our experience into a continuous scheme with the past as at the time content of memory, such as to appear then to give to experience, according to circumstances, the form of an inevitable continuity of expanse in nature or of succession in time, which thereafter endures with our consciousness; and this process as such constitutes the usual clearer and clearer understanding of things. We further found that this whole movement in understanding could not have at any point, as is commonly supposed for the relationsip between knowing and object known, the character of the ordinarily conceived mechanical process in nature; for, when considering things as they appeared to stand out clear and real in nature most independently in the mechanical conception, a complete inner perversion took place throughout the whole conception of the matter giving it entirely the opposite of a mechanical aspect, so that then for the first time, by way of the emphasis in the contrast, both the natures of the independent inert material and of the intangibly active ideal became definitely real. This inner perversion, as ultimate substance of all matter of experience, is thus of such a nature as to present in succession two contrasting and incompatible aspects in a thing, revealing essentially and distinctly an immediately given appearance of a thing in experience and an active construction in the thing; so that the thing in nature as understood always consists of two clearly recognizable and distinct component elements, namely the physical and the metaphysical corresponding respectively to the outer form and inner content as referred, on the one hand, to the thing in nature and, on the other, to the consciousness of the thing, though ultimately these two forms of the outer and inner are found to be identically the same. Now, this movement in understanding the nature of a thing imposes an inviolable form upon the component elements as well as upon the recognized change in the course of experience; and the scope of this form must, of course, cover the actual formulations of science itself, since these become in the form of individual occupations the significant moments in the movement as it forms the course of experience. Then also, the character of a real experience requires certain

forms of absolute contrasts in which as such the continuity of scheme cannot have the same kind of existence in nature as the real detail, because this would tend to obliterate the contrasts that give reality to the detail; and the detail of experience, therefore, has at the outset the appearance of a mere chance occurrence in which the continuity of scheme appears only from the fact that a gradual variation of form in the detail is confined within certain highly probable limits of the variation as determined by what are then understood to be certain natural possibilities of mere individual knowing or experience. The character of obviousness of unity in these continuous schemes varies from that shown in the continuous realm of a single sense function, through that of the unity of different sense realms in an actual identity of knowing with a correspondence of parallel serial events from the different realms, to that of a recognized identity of realm of activity of different individuals, composed of a self and others, as shown by the possibility of conventionalizing this activity to form thereafter the unavoidable meaning or content of the living speech of a social order. From the selective action of individual consciousness as inevitably going with its reality within a social organization that can, as the unity in a social order, not stand out as existing thing in nature, we must come to find, accordingly, a conscious range of variation of detail of experience, in understanding the detail, according to some probability scale. This form in the social environment as understood, in which the formulations of science themselves become a definitely placed real occurrence, must thus become the true basis of these formulations and must in true science be so taken into account.

1. The Scale of Probability in the Ordinary Understanding of Things

To begin with, for us the validity of science, as now readily appears from the foregoing, must be identical with the real occurrence of science in formulations at certain definite points or stages in our experience; since this validity as such is a form of referring to preceding conceptions and their formulations and is thus the culmination of a past experience so that at the same time the mode of culmination and thus the validity of the science are determined by the past experience. The formulations, as content of the living speech, are essentially a corrective of prevailing conceptions, which makes them a part in the organization of the social order. On account of the diversity of conceptions implied by the very fact of the formulations of science while an expected acceptance of the formula-

tions is also implied, the individual producing the formulations must recognize in general certain definite forms of variation in the current conceptions with reference to which the correcting formulations are produced. But ordinarily such formulations could not prove to be generally acceptable without exceptions, because such acceptability would imply a general uniform preliminary experience such as not only the real experience in a social environment but even the fact of formulation precludes; so that only varying parts of the formulations must naturally prove wholly acceptable to different members of the social order. We must consider then what, under conditions like the foregoing, must be the general law of variation, or probable scale, of acceptances for the whole social order accordingly as minor variations should be introduced in the formulations to adapt them to the requirements of the experiences of different individuals of the social order.

We will begin by considering the conditions of variation where they cannot be found to determine inherently either for or against acceptance of a given formulation of science by a particular individual to whom the formulation may be presented. Any thing or matter in a real experience now at hand has to the extent that it is clearly recognized from definite contrasts also a definitely quantitative aspect; so that the equal probability of acceptance or rejection by any one individual under conditions as assumed above would be represented for us numerically by one-half each and the sum of these halves, unity, would simply represent all possible occurrences taken together, that is the occurrence both of acceptance and of rejection, thus:

$$\tfrac{1}{2}+\tfrac{1}{2}=1$$

When we come to consider the joint acceptance or rejection by two individuals, the formal part of the conditions of acceptance becomes more complicated. For the possibilities are that the two individuals may equally well agree or disagree on both the acceptance and rejection of the formulation; so that, as joint acceptance itself hereby receives a numerical value of one-half as well as the individual acceptance, the numerical value of the probable joint acceptance becomes only a half of the probability of individual acceptance or one-fourth. In the same manner the numerical value of the probable unanimous acceptance of a formulation by n individuals becomes $(\tfrac{1}{2})^n$. The numerical value of probable unanimous rejection is, of course, the same as the foregoing for acceptance. If, now, we take into account, for instance in the joint action of two individuals, that the acceptance by one may also go with the

rejection by the other, the probability that with the acceptance by a particular one of the two individuals shall go the rejection by the other has again the numerical value of one-half of one-half or one-fourth for the same reasons as in the above unanimous acceptance; but as these conditions may be reversed between the two individuals so as to give two equally possible ways of development for the general possibility of acceptance by one and rejection by the other, the probability of this division on the subject of acceptance is thus numerically double that of unanimous acceptance or rejection. This now covers all possible cases of variation in the joint action of two individuals; and the probability of all these cases together is numerically again unity, thus:

$$\tfrac{1}{2}.\tfrac{1}{2}+2.\tfrac{1}{2}.\tfrac{1}{2}+\tfrac{1}{2}.\tfrac{1}{2}=(\tfrac{1}{2})^2+2(\tfrac{1}{2})(\tfrac{1}{2})+(\tfrac{1}{2})^2=$$
$$\tfrac{1}{4}+\tfrac{1}{2}+\tfrac{1}{4}=1$$

The first term in the left member of this equation, for instance, represents the probability of unanimous or total acceptance of a formulation of a certain form; the second, the probability of half, or one of the two, accepting and the other rejecting the same form; and the third, that of total rejection of the form. That is, under the conditions assumed, the left-hand member of the equation is a scale representing the relative weights of the chances of the different modes of acceptance and rejection. This equation is simply the square of the first equation with the left member retaining its binomial form. Similarly in the case of acceptance by three individuals, we get the cube of the first equation, thus:

$$(\tfrac{1}{2})^3+3(\tfrac{1}{2})^2(\tfrac{1}{2})+3(\tfrac{1}{2})(\tfrac{1}{2})^2+(\tfrac{1}{2})^3=\tfrac{1}{8}+\tfrac{3}{8}+\tfrac{3}{8}+\tfrac{1}{8}=1$$

Here the first term represents numerically the probable unanimous acceptance; the second term, the probability of two-thirds acceptance and one-third rejection; the third, of one-third acceptance and two-thirds rejection; and the fourth, of unanimous rejection. And so on. The binomial expansion holds in these cases because both the expansion and the principle of variation are based on the algebraic principle of the combination of n things by a grouping with reference to two different aspects of the things; so that the scale of probable acceptance of a formulation in science by a group of n individuals would be given by the nth power of the first equation, thus:

$$(\tfrac{1}{2}+\tfrac{1}{2})^n=1$$

to be expanded, of course, by the binomial theorem.[1] The group of individuals in all these cases is, of course, the group of actual experience consisting of all kinds of individuals, mature and immature, educated and uneducated, and so forth. In passing it might further be noted here that this scale represents not only the chances of acceptance of a scientific formulation in a social order but also the chances that any given social event dependent on a number of distinct conditions will have these conditions favoring its occurrence or non-occurrence.

So far we have considered variation where its conditions assumedly in no way predetermine for or against its acceptance. Where they appear so to predetermine, the variation in so far loses its character of equal probability for opposite directions, which would be represented numerically by the amount of inequality in the original fractions of the expanded binomial, thus:

$$\tfrac{1}{3}+\tfrac{2}{3}=1,\ \tfrac{5}{8}+\tfrac{3}{8}=1,\ \&c.$$

In these cases the probability scale becomes asymmetrical but less so with increasing powers of the binomial expansion at a rate depending on the amount of inequality in the original fractions.[2] But where the inequality is as much as unity, the character of probability would be entirely lost; and the case, reduced to perennial individual fact implying an absence of all diversity, is therefore the limiting condition of variation from the nature of things never fully attained in real experience. Still other questions of conditions affecting the probability scale, as minor details under the general head, might be introduced; but with the proposed scope of this paper these could not be further to the point here. In general then, with these elements affecting symmetry, and so forth, also introduced in the construction of the probability scale, we get a general law determining the inner arrangement of any social statistical material as it presents itself to us in real experience. Further, as the content of any formulation, if real, must be immediately a part of the individual's own environment, an individual ordinarily sees the whole situation of this formulation socially roughly in the form of this probability scale; and on the basis of this scale in his conception, which represents also the weight

[1]The relations of the principle of the probability scale to social statistics were first presented in systematic form by Quetelet. A summary of his work is given by Hankins, *Adolphe Quetelet as Statistician*, in Columbia University Studies in History, Economics and Public Law, 1908, vol. xxxi., no. 4.

[2]But cf. also Johannsen, *Elemente der exakten Erblichkeitslehre*, Jena, 1909, p. 171 ff., in reference to biological variation.

of his accumulated past experience, is he lead to declare his partial or entire acceptance of a formulation. The numerical exactness of the scale itself, however, would ordinarily not be so found in any given instant of experience, as this by its regularity would tend to destroy the diversity fundamental to real experience; but it nevertheless serves the individual as a tool to investigate the diversity in a given experience at hand.[1] Thus, to the observing individual the amount of prevalence, or the extent, of a given conception, or of support given a social movement, as referred to this probability scale near its ends means the general exclusive presence or total absence, in the experience of the individuals of his social environment, of certain particular conditions or details as found in his own experience sustaining the conception or movement; while the middle of the scale means a pretty even balance of presence and absence of such conditions and details. Accordingly, the social environment will ordinarily show an arrangement of detail according to this scale; but in its real form for us the scale is a constructed scheme of things in the understanding and thus also subject to the selective action of the individual consciousness. This will give, then, two distinct aspects of the scale in actual experience.

2. The Probability Scale in the Arrangement of Experience

To begin with, we may note here once more the general fact that the immediate experience of the individual must be essentially composed of a single self knowing and a single all-inclusive object known as two mutually complementary or sustaining aspects or elements in a single fact; and these elements show an antinomic character under observation. Naturally then, in order that a specific individual as exclusive of others may have a real experience of his own so recognized by himself, this may only appear, when so recognized, from certain forms of variegation in the object known. But, as the single object known must also be, as mere object, perfectly continuous such that other individuals as also persisting conscious selves cannot be taken as separable and independently distinct parts or portions of the object as is done in ordinary experience, these different other individuals must ultimately really appear from what are essentially recurrent variegations of the same meaning or reference called reactions between living individuals in a social environment. Now, since the self knowing the other individuals cannot from its essential charac-

[1]Cf. v. Kries, *Wahrscheinlichkeitsrechnung*, Freiburg, 1886, p. 3 ff.

ter as knowing stand out as thing among other things in nature, it must recognize its own individual reality, as distinguished from others, also indirectly through the associations of certain forms in the object like the above showing the social relationships between self and others. For the individual persisting self, it is then particularly essential that a retained succession of diversities appear in these relationships constructed into a single scheme in which the diversities form the detail of a course of experience requiring a unity in knowing; and these conditions of a persisting individual self then actually form the whole of the social environment. The self through its knowing appears here as the only possible unity of the series in the experience from the incompatibility of the included elements, namely the present physical existences of active persons in nature and their past occurrences as content of memory, forming as such, however, the continuous course of history as well as the expanse of nature about us. But, because this recognized self in its present character is for reality so completely dependent on this course of history and expanse of nature, the whole of this must be taken as the indissoluble single activity of the self in nature. This activity, that we be able to recognize it as a course and expanse, must then consist of parts in nature set up by the understanding in some kind of perspective where the incompatibility of parts in the form of a past in memory and present existence give the form of the activity; while in growth the scheme of the activity has the character of an inner perversion in which the past as changing to present in showing the growth presents the form of an antinomy in both appearance and meaning. Now, this activity and growth, in its reference from the present to the past to be recognized as activity and growth, thus also forms a fixed continuity through completeness of scheme of the whole in the reference; so that we get the antinomy of a fixed scheme and a change identically in the same matter of experience, that is the persistence of a certain form throughout a changing succession to show that the series of occurrences is controlled as a whole by a single law.[1] This law so recognized is, of course, then the constructed scheme of a matter of experience in our understanding, through which the recognition of self is at the time incidentally also realized, and forms the basis of the probability scale as actually recognized in experience.

[1]Cf. Quetelet, *Anthropometrie ou Mesure des differentes Facultés de l' Homme*, Brussels, 1871, pp. 17-21 ff.

A. Arrangement in the Environment in Nature

We find, then, that with the recognition of change, that is diversity, we have also that of the persistence, in the same matter of experience, of some constant or fixed form attaching immediately to all the diverse occurrences. Only by this contrast with diversity can the full nature of the constant form come to be recognized. The most complex and accordingly the most striking of such persisting forms is what is ordinarily called life, in which we see carried through an irregularly changing environment the living organism retaining under slight passing modifications its general form. That the uniformly essential conditions of life may appear to be such essential conditions, it becomes further necessary that the persisting forms in different instances vary within the limits of the essential conditions, so that the conditions recognized may appear as the single law governing throughout the different instances. The diversity under this law, to appear such, must be in the form of a more numerous occurrence of instances near the more favoring conditions under the law with a gradual decrease to a vanishing point near the limits of the conditions of possibility. This kind of persistence of form through diversity then gives the cohering perspective of things in nature, also of events in history, as the framework or skeleton of the unitary principle that we call law, whose unity as single operating law really so present is possible only in actual knowing at the time. But this unity has, beyond this general and rather indefinite description, no definite character for us in experience until we recognize it in turn as occurring as instance in a still larger diversity having its own law under which the unity is again a variant. And this progress to such a larger diversity will always go on in the developments of science until the single unity of all matter of experience is found to be the persisting self knowing at the instant; and finally, real science itself as the active formulation and occupation of a specific individual appears also then as an instance in a larger diversity.

Accordingly, in ordinary experience we group the things in nature into classes, like trees, pebbles, houses, different kinds of plants and animals, mankind, and so forth, with a diversity in the physical proportions of members of a given class such that the members having physical proportions approximating closest to the average are most numerous, while there is a diminution in number according to the foregoing probability scale with increasing divergence from average proportions until zero is reached at the extreme limits of the conditions of their existence. Thus, in the case of man himself, for instance, it

has been found, as much as a half century ago now, from the measurements of men for the army in different countries that the distribution of individuals for different physical proportions follows very closely the probability scale,[1] so as to indicate a controlling type with variations, subject to this type, having a distribution about the type like errors of observation normally have. The same kind of distribution is found in the physical measurements of plants.[2] However, not only these variations of physical proportions in a given form or type have this distribution but also the forms of activity of individuals considered from the point of view of actual accomplishments, as is shown by both government and private social statistics and by laboratory experiments on individuals. Thus, the variation of accomplishments by individuals show in social statistics of groups the same general form of distribution of numbers, for instance, of individuals grouped according to their rate of daily earnings,[3] of individuals in a certain vocation or in certain economic circumstances at different ages,[4] and so on. So we have a similar distribution in the degree of accuracy of the continued or repeated performance of a given task by the same individual as well as by different individuals.[5] For instance, von Kries has shown[6] what he designates a pronounced uncertainty of memory and power of comparison for visual angles varying in degree according to circumstances and conditions of training and according to the nature of the object. As, however, the realization of actual knowing is immediately dependent on a diversity in the things in nature known such that at one time this diversity appears as a change in nature and at another as the activity of self, so this uncertainty of memory and comparison at one time appears as a physical condition and at another as a dialectic selection of consciousness because of the mutual dependence of the two; and, from the continual regression to the average as necessary condition of the real experience of an individual self, this also results in a distribution according to the probability scale. That is in general, we find the material in nature presents a diversity in experience of such a form as to reveal at the same time a determining type in the diversity, as in our understanding we bring

[1]Quetelet, *op. cit.*, p. 258, note; p. 285 ff.

[2]Johannsen, *op. cit.*, passim.

[3]Bowley, *Elements of Statistics*, London and New York, 1907, p. 89 ff.

[4]von Mayr, *Statistik und Gesellschaftslehre*, Freiburg, 1895-1910, vol. II., pp. 132-141.

[5]Thorndike, *Mental and Social Measurements*, New York, 1904, passim.

[6]*Beiträge zur Lehre vom Augenmass*, in Beiträge zur Psychologie und Physiologie der Sinnesorgane, Helmholtz Festgruss, Hamburg and Leipzig, 1891.

the detail into a single scheme. This construction of a scheme is itself subject to diversification in the form of the above uncertainty of memory and power of comparison; so that the knowing self, dependent as a specific self upon a continued schematization of the material in the object it knows collectively as the social order, will be found involved in a continued activity of working with the material forming the social order and having the characteristic diversity of the probability scale.

B. Arrangement of Individual Activity in a Social Environment

As the materials in the object known and the self knowing the object have a mutual relationship of an indissoluble character, the one being wholly dependent on the other for its very reality so that the arrangements of the materials in the object known appear as the activity of a specific self so recognized in a social order; we shall need to consider arrangement in our experience as having all now the aspect of individual activity. The activity of self to be considered is, more particularly, the conventionalized conscious content of experience in which our own self appears among other selves from certain constant and specific relations in one and the same object of our consciousness making the activity of different selves essentially coincident. For, this activity, in which alone one self, as our own among others, may become recognized, is essentially and immediately the active communication by the living speech. The actual occurrence of speech comprises articulated oral sounds or written characters with various accessories added by convention or custom, and this physical occurrence of speech in, and related to, a material environment as thus referring to a social environment together immediately forms the recognized meaning and content of the living speech; so that the activity of self as such can be only this content of speech as composed of both physical and metaphysical elements of experience. Then, the communication of one individual with others in the living speech is recognized as having a certain characteristic form ordinarily called, as referred to speech, statement and reply. The essential nature of this statement and reply is shown in its meaning as corrective of a preceding content of speech in that through this the experience of one individual receives its distinctive character as over against that of others; so that the specifically responding individual must also appear, by his responses, as one occupied at a specific task but a task of interest to his hearers, the limiting of scope being after the manner of the specialized professions in, and dependent on, a social order.

To consider more particularly this diversity in individual activity, we have already noted the occurrence of diversity in the physical proportions of detail in the natural environment now found composing immediately the complete existence of the activity of the individual self; but these were still the proportions of detail in an environment of statically given form in which activity as such would not be possible.[1] Activity requires change of a definite character in a definite direction, particularly a change which gives a character of diversity to the activities of different individuals that makes possible and realizes the contrasts necessary for the corrective statements and replies of different individuals as such in speech. The two components in this speech are the diverse detail in the activity of the individuals and the single fact of activity so recognized; and this single fact of activity is so recognized in that the included detail appears as variant forms, within definite limits, of a general law or type of detail to which there appears to be a continual return such as to approximate the type more numerously near it than farther away from it, after the manner of the biological law of regression to the average. We may note here especially that Galton's studies[2] of the abilities of individuals, both physical and mental, have shown a distribution of this ability, more especially within the family relations of specific individuals of ability but incidentally also within a race or people as a whole, according to the probability scale. In the scale for the race as a whole, the individuals distributed about the extremes represent the eminent or able and the dependent or imbecile respectively. But it must be noted, what Galton failed to recognize adequately, that the greatness and dependence of the individuals are the forms of their function in a social order recognizing them as great and dependent respectively. For, the recognition of greatness and dependence, essentially based on past accomplishments, requires a stable, persisting social organization formed thus by the activity of social individuals to become the content of a living speech; so that for the necessary permanent functioning to this end the individuals must, to begin with, have an appropriate and permanently diverse endowment. That is in general, the individual of specific disposition and occupation can only become clearly so defined in his peculiarities when he is also indissolubly involved in the unity of a permanent social order, in which occur also all the peculiarities specifically and enduringly excluded as negatives of those of the individual and

[1] Cf. Stern, *Ueber Psychologie der individuellen Differenzen*, Leipzig, 1900, pp. 9-10.

[2] *Hereditary Genius, an Inquiry into its Laws and Consequences*, 1869-92.

which through the active contrasts makes the individual's peculiarities real present occurrences; and all of this means simply that the diversity among members and their unity in a contrast to reveal their diversity are the two components of a real social order.[1] Now, science, when a real fact and as such clearly and fully understood, must also be considered as a specific occupation, because it is essentially a conventional formulation of a corrective response to previous experience in a social order; so that science as such an occupation is definitely placed at one end in a continuous scale of variations with mere unintelligent, blind, hapless activity at the other end, where these two extremes represent the theoretical and abstract and the practical and concrete in occupation respectively throughout the social order. More specifically then, this places science as the appearance of knowledge from a conventional formulation, in a unity on a common plane with all special occupation dependent as such on the social order.

3. The Scope and Permanent Basis of Science.

In a study of this character we necessarily find, already at hand, a highly complex social organization in which alone individuals can come to recognize their own self as distinct over against others with relations between the self and others to constitute the incident but important communication in speech. This is the necessary condition to make the present study possible; since this study itself, like all science, partakes again of the character of a communication between individuals. It must, therefore, also recognize definitely its own position of being an occupation of a special character in the social order; as this must impose an unavoidable first or general form on any truth it may be presumed to reveal, on account of the special point of view it gives. This recognition of its own position is then not a mere looking at itself, as this would prove to be an endless chain or so-called vicious circle; but it is a noting of the specific course of its past development as far as determining present tendencies and so influencing present results. Considering the corrective character of the formulations of science and the diversity in the experiences of individuals making the formulations, we readily see that the development in its complete relations is of the same general character as the development resulting from the periodical exercise of the election franchise by the citizens of a state; for, the election results in the elevation of a certain type or ideal of

[1] Cf. Stern, *op. cit.*, p. 18 ff. Also Binet & Henri, *La psychologie individuelle*, in L'Année Psychologique, vol. ii., 1895, p. 411 ff.; Binet, *ibid.*, vol. iii., 1896, p. 296 ff.; Leclère, *ibid.*, vol. iv., 1897, p. 379 ff.

governmental control with divergences in the hopes and aspirations of the electing individuals according to the law of variation about a type. The forms of reality of science and also of the origin of science, as well as the different forms of social institutions, educational, religious, governmental, and so forth, are thus all immediately typical acts of response, taken in the aggregate, of individuals to social stimulus. The usually occurring typical variations of response then necessarily give a variety of sciences and also a recognized diversity of proficiency in their formulations. Accordingly, whenever we see or presume, as formal scientist, that science, as we ourselves of course now formulate it, is final and may alone explain and reveal the truth in a matter of experience; we are really considering only the momentary form, in the experience of the instant, of a mere present object known, standing out independently distinct as in ordinary consciousness, without regard to the actual knowing through which the object is related to the past giving it its distinctive character. Here we will consider specifically first these origins and sources of science.

A. Origins and Sources of Science

Science, as far as it is real to us, is itself an actual experience; so that it is, as such a real fact, not the revelation of a final truth but a formal or conventional statement by way of reaction upon the previous revelation of a truth. As a real fact in our experience, science itself involves, therefore, a truth not yet revealed. It thus takes its origin where a developing new truth is recognized as contradicting the prevailing conceptions of truth. The recognition of such a truth requires for its reality a specific formulation by an individual by way of reaction to given conditions requiring a formal corrective statement of the new truth by the individual; so that, as it then stands formulated, it must normally represent the truth of the individual's reactions to the given conditions. This gives us in turn a new condition because it is a specific, and therefore an exclusive, formulation of a truth which, by being an exclusive formulation, represents only partly the truth; so that a further reaction from another direction will be inevitable. And these successive reactions will continue, which is indeed a fundamental condition of continuing consciousness; so that the whole succession must represent the real truth in the matter. But this truth of a succession, to be truth of a succession, must have the reacting individuals and their activity in the reactions as mere constitutive parts but as essential elements in the succession, in which the elements with their relations become the sources of special sciences; which presents once

more the antinomy of the individual and social aspects of truth already noted. Now, the knowledge of this truth has again a specific development such that its content becomes one of a variety of distinct aspects in one and the same matter of experience. And these aspects reveal their truth only by their appearance of being complementary to each other; as for instance, the distinctively present existing individual as exclusive of all others not now present but the whole thus in a single series culminating in the present; the discreteness of parts in this series and their unity as necessary to show this discreteness; the subjective and objective aspects involved through this unity; and so on, as variously indicated throughout the foregoing. With a necessary diversity in the social order to reveal individuality in experience as already found, these distinct aspects become then the basis of distinct sciences.

We may note that, in general, science as a real fact is an understood meaning in a conventional formulation, in which our own understanding has constructed the meaning and placed it in the formulation. Science thus must derive its validity for us entirely from the character of our previous experience with the matter and conditions of the formulation; and its very reality is dependent upon a specific social stimulus calling out a formal corrective statement from the individual in answer to prevailing conditions. Thus, in considering in the Introduction the scope of the subject-matter of this paper, we noted various current conceptions in regard to it, analyzed more completely in section II., with a view to examining more fully their bearing on the problem in hand. We found that current conceptions did not and could not adequately represent the facts involved; and a conclusion was formulated formally correcting the original conceptions.[1] The conclusion thereby received a form to which the previous conception was still indispensable.[2] This development of conclusions may, of course, extend over great periods of time, as for instance the development of optical instruments in connection with the sciences dependent on them from the end of the sixteenth century to the present; in which the greater length of time tends more to obscure the relations of dependence between any given stage and preceding ones. Such stages in the history of science appear not only related to the preceding but preceding results must often precede even as successive detailed steps of usually a varyingly conspicuous character in order that the

[1]Cf. p. 23 ff., 28 ff.
[2]Cf. p. 10 ff.

stage in question be possible.[1] But with the obscuration of relationships to preceding results, the individual giving conventional form to the results of his study will ordinarily suppose he formulates a distinct and complete science, whereas the very fact of formulation purposes to give correcting information. So with the method of all real science and the arts. Now, as the very fact of conventional formulation in science implies a contemporaneity of diverse results in which each result would, of course, also stand as a corrective, or perhaps more accurately as an amplification of one or more other results and in every case these others in turn also of still others *ad infinitum*, we come here to a consideration more especially of the nature and extent of this diversity in science in its bearing on the truth to be revealed.

B. Nature and Extent of Diversity in Science

Science, we have found then essentially, is possible and can have reality only under conditions of continuous development in a social order. For, it is an understood meaning, corrective in character with reference to previous conditions, in a conventionalized matter of experience and this not only in a formulation originally presenting the science but also in the subsequent interpretation or understanding by others; since in any case a meaning is always constructed by the understanding and put into an appearing matter of experience. For mere continuing consciousness as well as for reality of science, as complementary aspects or moments, a continuity of development with an included diversity of detail is indispensable; and in the social environment this means essentially that individuals have varying occupations such that, where the occupation is the conventional formulation of a science, each individual would give a different formulation to the science as long as, and because, any formulations are at all made. Now, our experience is, of course, a single fact brought into a unity for us by a single knowing; and any fundamentally distinct diversities at all so recognized must be recognized by the same individual to bring them for comparison within the single fact of his own experience, and, appearing in the single fact as contents of distinct sciences, they must then really be in the form of distinct aspects of the same fact. We ordinarily consider experience at first of the form of something now merely present, the object known in the form of mere independent material existence, because its relations to knowing are at the outset

[1]Cf. Dannemann, *Die Naturwissenschaften in ihrer Entwickelung und in ihrem Zusammenhange*, 2 vols., Leipzig, 1910-11, passim.

not recognized. But upon detailed examination of the independent material existence as such, as was shown in sections I. and II. of the foregoing, a perversion, to form a complete antinomy of this material existence, resulted transforming the whole into a purely ideal experience. In this transformation we get now two contrasting aspects of a character that the analysis of either, giving the complete content of a positive science, is necessarily found to comprise all of the matter of experience conceivably possible at the time. It is in this contrast of distinct all-inclusive aspects forming complete contents of positive sciences that we begin to see the true nature of the diversity of the sciences, of which we must next consider more particularly the extent.

To consider now more in detail the antinomic moments of experience just indicated as they become fundamental to the diversity in science, we note again that the mere physical existence of a matter of experience always presents itself first to us; for that is the mere presence and distinctness of a matter given immediately with its recognition, of which the relationships are attained later as a metaphysical construction. A science of this physical existence could be nothing more than a recounting in detail of all the successively occurring existences including actions of individuals as far as mere existence. The mode of recounting the detail for science then shows that an individual persisting soul recounts the detail made thus to stand out in succession before the soul, while this soul itself can and does at no time in any way stand out anywhere. Accordingly, the soul itself cannot be observed for purposes of science like the existing things it observes for such a purpose; but only an indirect method of noting its activity, in recounting the details of experience for the formulations of a science of this experience, may reveal the nature of the soul itself such as this is sought in existing things of experience. This indirect investigation of the nature of the individual soul then soon shows that it is impossible to draw definitely a demarcating line between the soul's activity purely as such and the existing things in nature. For, things in nature have in their complete form as recognized, for instance, an inner nature, a relationship with other things in their environment, and so on, which show on their face that they can as such not be part of the purely physical existence before us; in fact, the very continuity of things as we find them must be an active construction in knowing. In this construction we get the contrasts of things or parts with an environment, by which they come to stand out as existing in the form they do; so that the mathematico-physical analysis of the continuities in nature into ratios of

contrast is not only possible but this analysis alone in fact adequately represents the essential nature of existing or real things as such. Then, as this same process of analysis, revealing the nature of existing things, as the activity of the soul, must also reveal the essential nature of the soul such as to throw the meaning of a scientific formulation and the nature of the soul into an identity, the mathematico-physical analysis must become reduced to a mere psycho-analysis.[1] In this analysis when revealing a succession of aspects as shown above, the tendency is continually in the direction of losing all independent individual personality through the continuity of scheme resulting from clear understanding; so that the resulting science also assumes more and more an impersonal character, which reduces the resulting formulations to conventional speech forms. This impersonal form of science, to be such, can no longer refer to merely a present existing thing or to a particular soul knowing it, as thus specifically excluding others, but to a system of relationships in which the particular things and personalities are but components; and a science actually formulated and understood appears as a meaning in an individual occupation as such essentially a specific function in the organization of the social order as ultimate unity. Now, a given aspect of present experience, taken here as an antinomic moment as already shown above, is always all-inclusive in form; so that at the time any possible other aspect may in no wise be recognized, and the given aspect thus constitutes a complete science in itself as currently formulated. Real science is, then, always a specific exclusive aspect of experience, as indicated above, and is as such the meaning in a conventional formulation by an individual reacting to specific social conditions.

C. Diversity of Proficiency of Individuals in Science reveals the Scope and Basis of Science in the Social Order

We have in the foregoing been considering especially the source of diversity within science; but science as a whole as specifically so recognized assumes itself an exclusive form, as such in turn an instance in a larger diversity, also indicated above. For, science is essentially to be understood as the recognition of meaning in conventionalized forms of activity, which of course must be taken to include both interpretation and composition of the conventionalizations because both are mutually implied corresponding forms of reaction to social conditions; so that the full meaning is then the recognized

[1] Cf. also Judd, *Laboratory Manual of Psychology*, New York, 1907, pp. 5-9.

relationship of the formulating individual to his social environment as he reacts to the social conditions calling out his formulations. But we must note particularly here that the meaning of conventional formulation in composition, or of appropriate subsequent reaction in interpretations, is in formal science ordinarily for the most part actually taken as if in some way set apart from the actual social organization, the true content and meaning. This is really the character of formal science in educational institutions, where science is distinctly placed in parallel with other social activities of which it then purports to give the meaning in a formal way; so that we have at present, where science is distinctly recognized as such, simply a limited scope of activity for science itself excluding a remaining part of the whole social activity on which science is wholly dependent through its exclusion for its distinctive character. We have, accordingly, in formally recognized science, instead of the simple recognition of a single one of the antinomic aspects of experience as content of a positive science, a present physical activity of definite scope in the larger social activity in the general scheme of which the present physical activity is definitely placed so as to receive thereby its specific character. But the general scheme of the larger social activity and the individual experience definitely placed in it with a specific character given by the placing in the general scheme are then again a specific form of the above noted meaning, because both have the same form of metaphysical construction. This construction is thus always the true basis of meaning in science through being an indissoluble relationship of parts in a single fact to give the actual character to the parts.

As implied in these last sentences, our social order is composed of elements so related that these relationships constitute the very reality of the elements. These elements are the individuals and groups of individuals whose occupation then constitutes a specific function in the organization of the social order. The organization consists in a unity through diverse functions in different activities, including formal science itself, dependent on each other. This diversity of mutually dependent functions is variously realized, for instance, in the commercial world, where interest centers essentially in the distribution of wealth in which one or a very few are commissioned to direct the mode of distribution for the social order as a whole, a larger number of individuals associated with them directing subordinate distributions, and so on, until we come to individuals wholly dependent upon distribution made entirely for them; or again in the government of the